WHAT EVERY INDIAN SHOULD KNOW ABOUT HINDUISM

WHAT IS & WHAT IS NOT HINDUISM

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THIRUVANANTHAPURAM 695 018
www.iish.org www.iishglobal.org

Heritage Publication Series - 80
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1-12-2009 (3rd Edition)

Indian Institute of Scientific Heritage (IISH)
Registered Charitable Trust 328/99/IV
Ushus, Estate Road, Pappanamcode
Trivandrum - 695 018 (Ph.0471 - 2490149)
www.iish.org

Rs. 25/-

Printed at:
Sree Printers (DTP, Offset & Screenprinting)
Ind. Estate, Pappanamcode, TVM - 19, Ph. 0471 - 2490135
DHANYATHMAN

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Ac No: 57020795171
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In the service of the motherland and dharma
IISH Publication Team
For knowing Hinduism
You should know
the scientific meaning of
The Customs and Rituals of Hinduism.
The Literature and Message of Hinduism.
The Spirituality and Symbolism of Hinduism.
The Scientific and Technological Heritage of Hinduism.

For knowing all these, it will take more than a hundred janma/birth for you!

All the knowledge present in Christianity put together could be printed in one book. - The Bible

All the knowledge present in Islam put together could be printed in one book. - The Koran

But all the knowledge of Hindus is so vast that it cannot be printed in one book. So the Hindus have 4 Vedas, 19 Brahmanical books, Aranyakas, 108 Upanishads, 18 books, each under Siksha - Nirukta - Vyakarana - Chanda sastra - Kalpa sastra Vedangas, 18 Mahapuranas, 18 Upapuranas, 2 Itihasas, 6 Darsanas and 5 Upavedas..... an unending list of Hindu/Indian heritage.

If one copy of each of the above books is placed one above the other, it is said that the pile will have the height of 4 telephone posts. Hindus knew that the ocean of human knowledge is so vast that it cannot be presented in one book by one man or by one saint. Here is an outline of Hindu knowledge.
THE SCIENCE OF CUSTOMS
AND RITUALS IN HINDU DHARMA

What is the definition of a Hindu?: *Aa sindho: sinduparyantham yasya bhaaratha bhoomikaa maathru bhoo: pithru bhoo (punya) schaiva sa vai Hindu iti smruthaa: whomsoever, is considering the land between the sapta sindu (Indus valley river) upto Indian ocean as the motherland/ fatherland and holy land, is known as Hindu. This land is known as Hindustanam which is defined as follows: Himaalayam samaarabhya yaavath hindu sarovaram tham deva nirmitham desam hindustaanam prachakshate. The land created by god himself and which is lying between Himalayas and Indian ocean is known as Hindustanam.

Unlike other religions, Hindu dharma has many specialties. This is not known as a religion, it is known as the dharma. Either *Hindu dharma* or *sanaathana dharma*. *Sanathana* means according to *bhagavath geetha*, which cannot be destroyed by fire, weapons, water, air, and which is present in all living and non living being. Dharma means, the way of life which is the ‘total of all aachaaraas or customs and rituals’. The aachaaraas which are to be performed by the mother is known as *mathru dharma*, those of father is known as *pitr dharma*. Similarly there are *putra dharma* (dharma of son) *aachaarya dharma* (dharma of teacher), as a continuation we can say *bhraathru* (brother) dharma, *bhagini* (sister) dharma, *poura* (citizen) dharma, *raja* (king) dharma and so on. All these dharmanas have been described in detail giving the specific importance in the *dharma saastra* and *smruthies*. There is no specific English word for dharma, but it is the sum of the duties + responsibilities + privileges of that individual. Then what is the *sanathana/ Hindu dharma*? It is the total of *mathru dharma + pitru dharma + putra dharma + putree dharma + acharya dharma + poura dharma + ... +... etc.* Hence we say Hinduism is not a religion but the way of life.

One should always remember that in each and every aachaaraas / dharma there will be a component of spirituality in it. Without spirituality, nothing exists in Hindu dharma. Almost everyone
carries a wrong impression that this spirituality is religion. No! spirituality is different in Hindu dharma, where the question of religion does not exist at all, because Hindu dharma was not created by one individual/prophet/incarnation/…. Hence it is not a religion. Spirituality is a part of every Hindu custom.

What are the rules to be followed while practicing the Hindu customs and rituals (aachaaaraas) ?. This question has to be scientifically analyzed. Whatever may the aachaaaraas we are practicing in our life, it has been told that saakshaath anubhavairdhrushto na srutho na guru darsitha lokaanaam upakaaraaya ethath sarvam pradarsitham. Aachaaaraas are to be followed based on their merits available from the self experience, one need not blindly follow a teacher or someone who gives advise without reasoning. All these aachaaaraas are mentioned for the prosperity of the human beings and it should be the prime focus for practicing the Hindu aachaaaraas.

Achaaryaath paadam aadatthe paadam sishya swamedhayaa paadam sa brahmachaaribhya sesham kaala kramena cha is another important advice given in smruthies. It means one can get one quarter of the knowledge from the teacher, one quarter by analyzing oneself, one quarter by discussing with others and the last quarter one can get during the process of living by the method addition, deletion, correction and modification of already known aachaaaraas/ new aachaaaraas.

It is mentioned that we have to take one quarter from the teacher/guru. Now, what is the definition of a guru or teacher. Aachinothi cha saastrarthaan sishyaan saadhayate sudhee swayam aacharti chaiva sa aacharya iti smruthaa: who is knowing the scientific meaning of the purpose of the aachaaaraas, who can teach the student very systematically and who is following (all what is taught to the students) in ones own life, that person is fit to be called as the teacher/guru. Here, one can see the qualification of a teacher who can define and explain about the aachaaaraas.

Can we practice the aachaaaraas at all times with the same level of
devotion? This is a common question asked. The answer is also given in our smruthies. Swagraame poornam aaachaaraasasm anya graame thadardhakam pattane tu thath paadam yaatre baalaad aaachaaraasasthet. In one’s own village, practice all the aachaaraas, in other villages (while travelling or staying) practice one half of the aachaaraas, in the cities/towns follow at least a minimum of one quarter of them and while traveling, like a child one need not practice any of the aachaaraas.

Should we practice the aachaaraas blindly saying that those aachaaraas were followed by my father or forefathers? Thaathasya koopoyam iti brwaana kaa purusha kshaaraajalam pibathi. Saying that this well was dug by my father (and for showing respect to him) one need not drink the salt water (if it is present) in the well.

Aachaaraas need not be the same in Kerala and Kashmir, similarly for a Hindu the same customs cannot be practiced in America and Rajastan desert. Hence depending upon the place, time, season, age, availability of the materials, financial position of the individuals, the aachaaraas can be duly modified.

The same principle one can see in bhagavath geetha also. Lord Krishna told Arjuna in the end of Bhagavath geetha, that vimrusya ethath aseshena yathaa icchasi thathaa kuru: Hey Arjuna all those whatever I have told you, critically analyze, and the option for accepting or rejecting is yours.

These are the rules one should follow while analyzing and practicing the aachaaraas in Hindu dharma. There are many words of guidance given in dharma saastra book. Saastram pramaanam: scientific results are the first basis, aapta vaakyam pramaanam: guidance to be taken from the scholars is the (next) basis, prathyaksham pramaanam: the direct experience is the next basis, anumaanam pramanam guessing the consequences/results, if none of the above parameters is available. These are the steps one should select for the analyses of the aachaaraas.

What are the purposes of practicing the aachaaraas? It has been described in the smruthies (which are also known as
dharmasastra) : uachaaraath labhathehyaayu: aachaaraath
dhanamakshayam achaaraath labhathe suprajaa achaaro
ahanthya lakshanam. By following the achaaraas one gets
health and longevity, it leads to prosperity, it gives social
relations and friends, and the followers of achaaraas are
considered as the embodiment of nobility. Aachaara heenam
na punantu vedaa: The person who does not have the habit of
practicing the good achaaraas, cannot even be purified by Vedas.

What are the achaaraas? Those customs and rituals which are
irrelevant in the modern times are known as anaachaaraas,
those which lead to negatives/deleterious results are known as
duraachaaraas and those achaaraas which give very positive
and useful results are known are sadaachaaraas or generally
known as aachaaraas.

The sadaachaaraas are followed for, any one or more of the
following purposes in the Hindu dharma. The achaaraas are
those give psychological, physiological, family relation and
bondage, social relations and bondage and national
integration based positive results. Focusing on the above five
points one can analyze very systematically all these achaaraas.

**Psychologically beneficial achaaraas/ customs and rituals:**
Few examples are selected for explaining these type of achaaraas
The morning and evening prayer, the positive songs and
keerthans, the Vedic mantras which produce psycho linguistic
and neuro linguistic effects, etc are psychologically useful
achaaraas. They give extremely good response in the brain
cells by way of producing curative hormones. The blessings of
the elders and parents, the encouragement given to the children
and also to those who are desperately struggling in the life, the
words of consolation, the blessings like vijayee bhava, the
achaaraas in social gathering and family functions, etc give
psychologically positive results. (All these achaaraas are also
spiritually connected, is the Hindu way)

**More examples:** Reading a puraana gives the messages of ups
and downs/ failures and success/ pains and pleasures in the life.
The stories of Sri Rama in Ramayana and that of Pandavas in Mahabharatha inform us that there are sufferings in the life and everyone should face them boldly. Reading Bhagavath geetha is for mentally preparing to face any type of consequences and without failure practicing the swadharma (ones own duty). Through puranic story telling for the children, value based messages are given in the form of story capsules to remain in the memory for many years and to get the reminder whenever the abnormal pathway is opted to in their life. Visiting elders on festive occasions is for getting value and experience based advice from their life. Respecting teachers and elders, is for keeping the values in ones life and in society for the learned people who continue to guide the society. Auspicious time selection for visits and performing ceremonies, is to take extra mental precaution to see that everything is carefully / systematically programmed and planned. Consulting a good astrologer is to see that things are meticulously planned and the blessings of the Vedic devathaas are assured for an optimism in ones endeavor (however this should not go to the level of superstition and should be carefully monitored). Performing pooja is mainly to see that good will come if good is practiced. And to give the feeling that rest is left to the divine mercy/ blessings. This blessing is directly assured (at least we feel so) by conducting poojas in presence of family and relatives (hence gives an opportunity for the family members to come together also). Worshiping the idols/ images having smiling faces (prasanna vadanam) gives a psychological positive feeling of confidence (avoid the worship of weeping/ bleeding/ cruel images as it gives a negative influence in the mind). Chant positive manthra/ keerthan/ bhajan for positive effect (neurolinguistic and psycholinguistic) and never chant crying or weeping songs which also influence the mind negatively.

Physiologically beneficial customs and rituals. You can also analyze these customs and rituals yourself on the scientific base. The soorya namaskaara / sun salutation performed in the morning is a combination of 7 yogaasaanaas practiced in ten
steps, which give smooth exercise for all the movable skeletal joints in the body and hence this is also known as 'the king of the exercises'. Morning prayer karaagre vasathe lakshmi kramadhye Saraswathi kramoole stithaa gouri prabhaathe kardarsanam: Sitting in the same bed where you sleep everyday, without cleaning the teeth-face-body, why this mantra is chanted, because the body was horizontal for the whole night while sleeping and it is going to become vertical (suddenly) when you get up. In the vertical position of the body the force exerted by the heart for pumping the blood is more, hence the change of position of the body from horizontal to vertical level should be slow and steady. Hence we are instructed to sit on the bed for few seconds (it has been statistically estimated that 23% of the heart attack deaths take place in the heart patients when they suddenly get up and stand/walk from the lying position). Similarly with a mantra we touch the floor samudra vasane devi parvatha sthana mandale Vishnu patnee namasthubhyam paada sparsam kshamaswa me. The bio static electricity in the body gets earthed through the fingers instead of the feet, reducing the chance of arthritis and many other nervous based disorders. Before taking the food, few second prayer is a Hindu aachaaraaas. During this prayer time and while looking to the food the flow of saliva in the mouth takes place and this liquid activates the generation of other digestive enzymes also, thus activating the process of digestion (a layer of saliva and digestive enzymes in the bottom of the stomach before the food comes to the stomach is a biochemistry). Fasting leads to cleaning of the intestine, certain fasting (partial) in which change of food is instructed in the custom, which leads to getting variety of micro nutrients from different types of food sources. Chooodaakarna the ceremony connected with wearing of the ear ring is just like giving the first vaccination and annapraasana the first food giving ceremony is like the first inoculation to the baby through the hands of different people (the ear ring in the former and food in the latter carries little dirt/germs which leads to augmenting the immunity in the
body of the baby). These are only very few among thousands of aachaaraas practiced by Hindus, for physiological benefit.

More examples: Do not keep the direction of the head towards north because the magnetic meridian of the earth retards the blood flow through brain capillaries and affect the functioning of brain cells. Avoid taking bed coffee to prevent the obnoxious decomposed materials generated by microorganisms in the mouth (in the night) going to the stomach to avoid the chance of stomach cancer. Wake up early morning, because the brain is perfectly active during that time. Take a bath in the morning itself so that all the decomposed products/salts/urea etc present on the surface of the body gets cleaned which prevents the skin diseases significantly. The cold water/hot water bath activates the biological process of the body cells to maintain the body temperature when cold/hot water bath is taken. Dhyaana / meditation activates brain cells. Praanaayaama activates the lungs cells and functioning. Taking thulasi water/theertha gives the medicinal property of the plant in it. Using sandal wood paste in the forehead gives the chance of absorbing the medicinal components in the chandan through the most sensitive part of the body. Visiting a temple (in Hindu worship, the temples are not merely prayer halls, they are quantum healing centers) gives energy to the body if pancha suddhee is maintained. Doing pradakshina to aswatha gives an atmosphere/air through which traces of ozone produced by the tree goes to the lungs and purifies the lungs. Attending and participating temple festivals give the opportunity for leadership qualities, social gathering, entertainment and hence variety of merits including spiritual benefits.

Customs and rituals beneficial for strengthening the family bondage: When we look for integrated development of the society, the family relation becomes the first step in the social life. There are hundreds of aachaaraasasas in the Hindu life which are exclusively aimed at strengthening the family relations and bondage. Every spiritual and family based customs are to be practiced by the wife and husband together. This strengthen the
family relationship. The message that maathru devo bhava, pitru devo bhava: Let the mother and father be divine to me (gods to me) convey a strong relation thread between the children and parents. The death anniversary functions known as sraardha are mainly performed to give the demonstration of the relationship between the parents and children. The demonstration from generation after generations.

In all the rituals, the individual is expected to tell the gotra (clan) and sootra (thread of connection) which again show the connection with the forefathers. During festivals, the parents were saluted/prostrated as maathru/pitru namaskaara, to get the feeling for the children that (whatever may be their age) their relationship, with the parents is not merely that of people living together in a house. This gives the message that in younger days children were looked after by the parents and in the old age, the parents should be looked after by the children with due respect and care. Similarly the relationship between the wife and husband is not merely the relation for sex, but for building a family with culture and values in the life. Through 16 sacraments known as samskaaraas (samskaara means refining or purification) the life of the baby is getting enriched by the values of the life. During the construction of the house the ground breaking, stone laying, the door fixing and house warming ceremonies are all connected with the star of birth of the wife, thus giving importance to the wife in the family. Without the husband or wife, the other (among the couple) alone cannot perform any of the household achaararas, which again makes it compulsory to build the strong family bondage. The marriage is performed by tying the thread- putting the garland- holding the right palm (paanigrahana)- presentation of the cloths or exchanging the rings- and by sirodhaara, these five rituals in presence of hundreds of invited guests/ and agni/fire give the feeling of strong wife – husband bondage. It is said that the marriage is conducted as agni saakshi. Thus one can analyze the customs to understand the impact of the family relations.
More examples: If properly performed matching a horoscope before marriage gives an opportunity for understanding the personality of the individuals who are getting married and suitable corrective measures can be adopted. Inviting relatives and guests for marriage gives an opportunity to share the joy among relatives and social and family relations get strengthened. After marriage ceremonies are aimed at getting a healthy baby and giving the feeling of love and affection among the couples. The jaatja karma of the baby is performed to record scientifically the position of the celestial body when the baby was born. It is the bound privilege of the parents to give the name for their baby and hence the name of their choice through naamakaranai, is given as a part of the samskaaraas. Dhampati pooja/ couple pooja is performed by other family members to remind their respect and appreciation on strengthening the bondage between the couples. Birthday celebrations are conducted to inform the duty and responsibility of the individuals when they grow and to remind them that the society and relatives are with them for undertaking the responsibility. Celebration of the 60th birth anniversary (shashtipoorti), to remind the time for doing more good for the society using the experience gained for the last 60 years of life, when the period of rest starts.

Customs and rituals beneficial for the social bondage: Inviting guests for family functions like birthday, marriage, during the death and after death rituals, getting together during the festival seasons like holi-deepavali-krishnaashtamai-ramanavami-celebrations etc. temple festivals, village festivals, are all aimed at building social bondage. Through these social relation building mechanisms the cultural relationship among Indians was built up for the last many millennia. Many spiritual and religious activities as samooha pooja, samooha bhajan, mantra aalapan etc are all done in groups with the leadership of the common Hindus themselves, not through appointed priests, which lead to the cultural integration of the social bondage in the Hindu society.
More examples: Family visits during happy and unhappy occasion by relatives and friends (even without taking appointments) is to confirm the family members that during happy and unhappy incidents in ones life we, the relatives and friends will be with them. Get together during festival occasions is for strengthening social bondage among the society members. Kumbha mela, vaisaaki, and many other festival is for sharing the joy and forgetting the negatives of the past and to build better relations ship among the members in the society. Group pilgrimage to long distance is to share the joy and difficulties together in the spiritual way to strengthen social bondage...

Customs and rituals beneficial for national integration: There are many customs which are followed exclusively for getting the feeling of patriotism among the Indians. The morning prayer (praathasmarana) we chant the names of seven holy rivers from Indian continent ... gange cha yamune chaiva... and seven mountains.. mahendro malaya sahyo... the great women of India... ahalya droupadi seetha... the great men aswathaama bali vyaaso.... Seven major cities of India ayodhya mathuraa maaya.... and so on. These stanzas were written three or four thousand years ago. This informs and reminds us that India was culturally one for the last many thousand years. The pilgrimage to north India by the south Indians and to south India by the north Indians are fine example of national integration. The customs followed in the immersion of the ashes (obtained after cremation) in kaasi/varanaasi triveni sangam by the south Indians and in kanyakumari triveni sangam by the north Indians lead to this national integration through visits and experiences of direct contact among south and north Indians (where the languages/food/dressing/cultural traits etc differ).

It is also important to note a very interesting fact, that for making any curries (food items) in south India, north Indian spices are required and for north Indian curries, south Indians spices are inevitable. Thus even in kitchen of Hindu family, the national integration can be seen. Learning of Sanskrit language, chanting of Vedas and related literature, the story of Ramayana and
Mahabharatha are all finally aims at integrating the people of India and give the message of unity in diversity.

More examples: A deep analyses of the holy places, rivers, mountains and asramas given in Ramayana and Mahabharatha when Sri Rama (in Ramayana) and Pandavas (in Mahabharata) visited during vanavaasa, give familiarity of the nation through itihasas and puraanaas. Puranic stories do influence the national integration. Pilgrimage to Aśrams, Gangotri, Haridwaar, Kailash, Kanyakumari, etc integrates the mind of all Indians towards the nation. The concept of *athithi devo bhava* to serve the people who visits our home without taking appointment gives the opportunity to know and help others. During the age old customs anyone who is on pilgrimage has to depend for the food and shelter upon the unknown people. People traveling from north to south and south to north of India, for the pilgrimage could take the shelter in the *athithi devo bhava* concept. Bharath maatha (mother Bharath) concept of the nation gives the relation among Indians as the children of the country. In mahasankalpa names of different kshetra in India are given (as parasurama kshetra (Keralam) - Sri Rama kshetra (Tamil Nadu) - Sreenivasa kshetra (Andra) - Jagannatha kshetra (Orrissa) - Bhaskara kshetra (Karnataka) and so on, which informs us that we are part of the great nation Bharath. Like this there are hundreds of the aachaaraas aimed at national integration.

Thus the aachaaraas are directly connected with the day to day life of Hindus. Even the spiritual rituals also compels us to pray *saha nada vavathu, saha now bahunakthu saha veeryam karavaavahe thejaswinaavadheethamstu maa vidvisha vahai aano bhadraa*. Let us exist together, share the results of the work together, work together, thorough that path way let us enlighten ourselves, let us not have hatred towards anyone, let noble thoughts come from all over the world. Hindus always prayed *lokaa: samasthaa: sukhino bhavanthu*. let everyone become happy. Hindus never prayed *haindavaa: samasthaa: sukhino bhavathu*. Let (only) Hindus become happy. Hindus never
said their pathway is the only correct one for attaining god. They always allowed other thoughts also to penetrate/integrate into the minds of the people, if those pathways can also fetch good results. Hindus are the only people who prayed sarve bhavanthu sukhina: sarve santhu niraamaya sarve bhradhaani pasyanthu maa kaschit dukhabaag bhveth. Let sarve- all become happy and glorious, free from pains and sorrow. Here too Hindus never said only let Hindus get all the benefit

Say that all Indians are proud Hindus whether they follow lord Siva, Krishna, Jesus Christ or Prophet Mohammed, if their blood is Hindu blood then they are Hindus. In India there are only two categories of people who are Hindus and who were Hindus. Those, who are following the sanathana dharama, even though born and brought up under different culture anywhere in the world, are also Hindus.

**HINDU (VEDIC AND RELATED) LITERATURE**

Christianity is based on one holy book, the Bible and the Islam is also based on one book Koran. But the Hindu dharma is based on many books such as Vedas, Vedaangas, Puraanaas, upa puraanaas, smruthies, upa vedas and itihaasaas. Since human knowledge is so vast, it is impossible to comment on that heap of knowledge in one book. Hence the Hindu Rishies wrote thousands of books and commentaries under specific titles. A Hindu can select the subject(s) of his choice. We, in our earlier publications have scientifically explained the Hindu aacharaas, Hindu spirituality, scientific and technological heritage of Hindus and now, it is necessary that every Hindu should understand what are the Hindu literature, atleast in a nutshell.

Hindu dharma is based on Vedas (the word Veda means knowledge). Vedas are foundations of Hindu dharma. All other Hindu literature are directly or indirectly linked with Vedas. There are four Vedas. They are Rigveda, Yajurveda, Samaveda and Atharva Veda. Vedas are known as anaadi because their period of composing is not correctly known. The authors of these
manthraas are known as manthra drushtaara, means those who could see the manthra when they composed them. Vedas are also known as apourusheya means composed by Rishies having the talent beyond the level of ordinary human beings. All these manthras are classified by Maharshi Krishna dwipaayana, who was later known for his meritorious work as Veda Vyaasa who was born to a fisherwoman, into Rig Veda, Yajurveda, Samaveda and Atharvaveda.

ANALYSES OF VEDAS

Analyses of Rigveda: Rigveda is the oldest book of the human race. It might have been composed many thousand years ago. It is composed by hundreds of Rishies and their names are given in the beginning of each sooktha. It is written in poetical style/language, known as Riks, The Riks (stanzas) put together becomes sookthas. Rig Veda has 25 recensions of which only five are available now. They do not differ significantly. The available recensions are known as saakala saakha, baashkala saakha, aaswalaayana saakha, saankhaayana saakha and maandukeya saakha

The most popular Sakala saakha of Rigveda has 64 chapters. Manthras are classified into 2024 Vargas which are made out of 10552 Riks. These manthraas are composed with a total number of 193816 Sanskrit words. There are 397265 letters in Rigveda. Some of the names of the Rishies who composed the Veda manthras are Kasyapa, Viswamitra, Kanwa, Paraasara, Gouthama, Bharatha, Vamadeva, Gopayana, Athreya, Aangeerasa, Bharadvaja, Sounaka, Gargya, Praagaatha, Vasishta, Yama, Samvana, and so on.

Analyses of Yajurveda: More than one half of the manthras in Yajurveda is taken from Rigveda and remaining composed by Rishies of Yajurveda. It is said that there are 100 recensions for the Yajurveda. Names of some of these recensions are: Aalambhi, kalinga, kamala, ruchaabha, aarunee, thaandy, syaamaayana, kata and kaalaapi. The Kata saakha has been further separated into charaka kata, aahwaraka kata, bhraajishtala kata, kapishta kata,
chaaraayaneeya kata, praachya kata, swetha kata, swethaswethara kata, oupamanyava kata, paathaandineya kata, maithraayaneeya kata,..... and so on. The series go upto one hundred recensions. Few of the Yajurveda recensions have only-poitcal manthras and the remaining have both poems and prose. All the recensions which have only poems are known as Sukla Yajurveda and other set is known Krishna Yajurveda. All these recensions together is known as the tree of Yajurveda (Yajurveda vruksaha). There are 40 chapters in the Sukla Yajurveda recensions and in other recensions the number of chapters vary. The 40th chapter of Sukla Yajurveda is Eesaavaasya Upanishad, the only Upanishad coming as a part of any Veda

Analyses of Sama Veda: This Veda is chanted by specialists known as udgaatha, means musicians of vedic traditions, and the manthras are highly complicated music in nature. There are 1000 recensions for Sama Veda and only 13 are now available. Some of their names are: Raanaayaneeya, saatyamugra, Vyaaasa, bhaguree, oulundee, goulguvi, bhanuman, kaaraatee, masaka, kouthuma, saaleehotra, jaimeeneeya, and soon. There are total 1861 manthras including 267 repetitions (punarukti). By tradition some of these manthras can be chanted only in village environments (graama geya ganaas), some are only in forest (aaranyageya gaanaas), some are to be chanted at very low voice (ooha gaanaas), some are permitted only in the mind (sound should not be heard outside) known as oohya gaana. In Jaimeeneeya recensions of Sama Veda, it is said that there are 1232 graamageya gaanaas, 291 aaranyageya gaanaas, 1802 ooha gaanaas and 356 oohya gaanaas. Generally the Sama Veda mantras are chanted during yaagaas.

Analyses of Atharvaveda: It is said that there are 50 recensions for Atharvaveda. The recensions now available are only 9. pippalaada, thouda, mouda, sounakeeya, jaajala, jalada, brahmavada, devadarsa, and chaarana vaidya. There are nearly 6000 manthras in Atharvaveda of these 1200 manthras are taken from Rigveda. Atharvaveda is more social in spirit than the other
three Vedas. This Veda is also known in different names like kshetra Veda, Brahma Veda, Aangeerasa Veda, and soon.

ANALYSES OF BRAAHMANAS

Brahmanaas sometimes come as the part of Vedas (as in Krishna Yajurveda) and generally they are separate books. They describe the method of yaagaas and customs and rituals for conducting the yaagaas. Generally it is difficult to understand the explanation of the subject without the commentaries. For Rigveda there are two Brahmanaas known as aithareya brahma having 40 chapters, the second one saankhaayana brahma having 30 chapters. Both explain the ritual connected with the yaagaas. Yajurveda has Sathapatha Brahma composed of 100 chapters in one saakha and in the other saakha it has 104 chapters, which give many historical information on ancient India Bruhadhaaranyaka Upanisad is a part of this brahma. The second brahma of Yajurveda is thaithireeyaa brahma (this becomes almost as a part of Yajur Veda itself, unlike other brahmanaas) in which thaithireeyaa Upanisad, mahanaaraayaneeyaa Upanisad, yaajnikee Upanisad are included.

Samaveda has the following separate brahmanaas: thaandya – Upanishad – jaimineeya- devathaadyaaya – samhithopanishad-vamsa- arsheya- shadvimsa- cchandokhya brahmanaas are the most important among the samavedeeya brahmanaas. Cchandokhya upanihad is a part of cchandokhya brahma. Atharvaveda has only one brahma known as gopatha brahma.

ANALYSES OF AARANYAKAAS

Aaranyakaas generally comes at the end of the brahmanaas or as a part of separate book. They are more philosophical or spiritual in subject. In Hindu dharma, there are four stages in life such as brahmaacharya, gruhaustha, vaanaprastha and sanyaasa. When one reaches the stage of (Vaanaaprastha) leaving the house and go to forest, the rituals are to be performed with utmost simplicity and these rituals are explained in aaranyaka. Rigveda has aithareya aaranyaka as a continuation of the aithareya brahma. In this aaranyaka comes the aithareya Upanishad, mahaithareya
Upanishad, bahvrucha Upanishad and samhithopanishad. In Kousheetakee aaranyak of Rigveda comes the kousheetakee Upanishad. Yajurveda has maithraayaneeya aaranyak which maithraayaneeya Upanishad comes. And in thaithireeya aaranyak comes thaithireeya Upanishads. Sama Veda and atharveda do not have separate aaranyakas, but the philosophical and spiritual subjects explained in the aranyakas are coming in some part of the brahmanaas.

ANAYASES OF UPANISHADS.

Upanishads are the philosophical and spiritual treasury of Hindus. The great messages of Bharath come from the Upanishads. They describe about the pancha praana, pancha bhootha, pancha karmendriya, pancha jnaanendriya and mind. They also describe in detail on specific spiritual aspects and rituals. The Upanishads are classified into five groups. Those belonging to Rigveda are 10 numbers. Upanishad belong to sukla Yajurveda are 18 in number. Those belong to Krishna Yajurveda is 32 and 16 Upanishads for Sama Veda and 32 for Atharvaveda. Each class of Upanishads have separate santhi manthraas. Only one Upanishad comes as a part of Veda, that is the eesaavaasya Upanishad. Few Upanishads as mentioned above come as part of braahmana texts few other come as part of aaranyakas. Remaining are separate Upanishad texts.

Rigvedeeya Upanishads : aithareya – kousheetakee- naadabindu-aathmabhoda- niravaana- mulgala-akshamaalika-thripura-soubhagyalakshmi- bahvrucha Upanishads belong to the class of Rigveda with saanthi mantra commencing from vang me manasi prthishtithaa.....

Sukla yajurvedeeya Upanishad: eesaavaasya- bruhadaaranyakahamsa- paramahamsa- subaala- manthrika- thrisikhibrahmana- niraalamba- mandala braahmana- advaya- thaarak- bhikshuka- adyaathma- muktika- thaarasara- yajnavalkya- saatyaaayana- thureeeyaatheetha avadhootha Upanishads belong to the suklayajurvedeeya class with the saanthi mantra commencing with poornamatho poornamidam....


ANALYSES OF VEDAANGAS:
Vedaangas are books connected with Sanskrit language used for writing the Vedas. There are six vedangaas. They are Siksha, niruktha, vyaakarana, chandas saastra, kalpasastra and jyothisha. The words vedaangas mean the organs of Vedas (parts of Vedas) All the rules defined here for writing the Vedic Sanskrit are also applicable for modern and ancient Sanskrit literature. Thus one can see that rules and science of language are also given through Vedic literature. In each branch of Vedaangaas, it is said
that there are 18 books written two/three thousand years ago. Additions, deletions, modifications and corrections are done when new books were written as original ones or as commentaries.

Analyses of Siksha: These books give the rules for chanting the Vedas. The word siksha means ‘learning/teaching’—it is the learning of the Vedas. These are known in the names of great sages: Yajnavalkya, Vasishta, Kaatyaayana, Naarada, Gouthama, Panini, Sounaka, Sisira, Aapisali—and so on.

Analyses of Nirukta: This is second among the Vedangas and this branch of study aims at teaching the formation of Sanskrit words used in Vedas. The roots of the Vedic words and the modifications taking place when the words combine. The most authentic book is the Nirukta written by Yaaskaacharya. There are 18 Nirukta books of which important among them are known in the names of Oupamanyava, Gargya, Galava, Vaarshyaayanee, Aagraayana, Saakapoorna, Aarnanaabha, Thaitik, Sthouleshti, Kroushtuka, Kaathyayana and so on.

Analyses of Vyaakarana: This is the Vedic grammar book, giving the grammar rules applicable for all the Sanskrit based literature written two to three thousand years ago. The most important among the vyaakarana books is the one written by Panini known as mahabhashya/ashtaadhyayee having 2105 soothraas/rules. The other important grammar books are known in the names of great grammarians Aapisali, Gaargya, Gaalava, Saakalya, Saakataayana, Bharadwaaja, Sphotaayana, and so on.

Analyses of Kalpasastra: There are four major subdivisions for Kalpasastra. The Kalpa sastra books discuss fully, the customs and rituals to be performed by each and every Hindu on individual-family-society and as a citizen bases. All the customs to be performed by a married couple in the family comes under the gruhyasootra. All the customs for performing the yaagaas and yajnaas come under the sroutha sootra. The rules and customs to be practiced by the citizens/officers/kings/ministers etc come under dharma saastra. The after death customs/rituals come under pitrumedha sootra. In fact all the Hindu rules/rituals/
customs are discussed in detail with due corrections/additions/modifications and refinement (required in the course of time), in these books.

Analyses of Jyothisha: This is the sixth vedaangaa, in which mathematics, astronomy and prediction part (astrology) are combined. There are hundreds of books written in ancient India on mathematics and astronomy which are the part of vedangaas. A few books are written on the prediction part of the Jyothisha. The first two parts are discussed in detail in the scientific heritage of India published by the Institute.

ANALYSES OF UPAVEDAAS:

Upavedas are the science books which come as subsidiary - upato Vedas. For each Veda there is a subsidiary. They are Arthasastra, Dhanurveda, Gaandharva Veda and Ayurveda respectively for all the four Vedas. The Sthaptya Veda/ vaastu has also been given the status of the upaveda.

Analyses of artha sastra: Artha sastra is economics and the most authentic books in this class of ancient Hindu literature is the Koutileeyam- Chanakya’s Arthasastra. This is an authentic arthasastra book with 6000 messages/rules written in 150 chapters. Each and every line in this book has deep message to convey. There are 18 artha sastra books written in olden days.

Analyses of dhanurveda: The books describe on science of archery. All the informations connected with the war and use of weapons are described in the dharmaveda. The most authentic book in this branch of upaveda is said to be written by Dronaacharya namely Dhanurveda. Detailed description of the subject matter is given in the great Indian epic Mahabharatha.

Analyses of Gaandharvaveda: detailed description of music, musical instruments, dance and related arts are given in the Gaandharva Veda text. This Veda is the upaveda of Samaveda. Sarngadhara’s sangeetha ratnaakaram is one of the important books coming under this class. Yaamalashtakam, uddheesamahodayam, maansollasam, sangeetha darpanam are some of the important books.
Analyses of Ayurveda: This is the upaveda of atharveda describing the health, food and diseases in detail. The Charaka samhita, Susruta samhitha, Ashtaanga h rudaya, Ashtaanga samgraaha etc are the reference books followed today for the ayurveda.

Analyses of Sthaapathy Veda: this has been given the status of upaveda of Atharvaveda, here one can read the rules and applications of Vaastu used for house/temple/ palace/ forts constructions

ANALYSES OF MAHAPURAANAAS:

There are 18 Mahapuranaas and 18 Upapuraanaas. Through these puraanaas ancient Hindu Rishies convey the dharmic messages as the stories and histories of the kings/ kingdoms/ simple experiences of Rishies and so on. Sometimes the messages through simple stories connected with gods/ human beings/ animals also come under the puranic explanations. All the information given in puraanaas are aimed at creating a scientific temper and realization of the facts and truths connected with our day today life.

Names and analyses of 18 Mahapuranaas: These mahapuranaas are huge volumes of books, many a times each written in 5 to 10 volumes with stories, histories, sub stories, upadesaas/ etc. The names of the puranaas: Vishnu — bhavishya- garuda- agni- mahaabhagavatha- siva- markandeya- linga- brahmavaivartha- malsyam- koorma- varaaha- vaamanaa- skanda- brahmaanda- padma- vaayu- naradeeyaa puranaas.

Names and analyses of upapuraanaas: It is said that these upapuranaas are less important when compared to the puraanaas. Their names are samba- devibhagavatha- kaalika- laghunaardeeeyaa- harivansa- vishnudharmothara-kalki- mulgala- aadi- aathma- brahma- vishnudharma- narasimha- kriyaayoga- soorya- bruhadnaaradeeya- purushothama- bruhad Vishnu puraanaas.

ANALYSES OF SMRUTHIES:

Smruthies are dharma sastra books which give the customs and rules to be followed. The book may explain some specific subject
as specialization in some cases and in some other cases, the smruthi books explain rules connected with many subject in an integrated way. Hence there are smurties written in many volumes and some smruthies are very small books. The smruties are updated with due corrections and amendments. The rules described in the smruthies vary depending upon the place and time, hence they are not universal truths and need not be practiced blindly.

The names of smruties: Smruthies are known in the name of following Rishies; Usana, Yajnavalkya, Vishnu, Manu, Aangeerasa, Yama, Athri, Samvartha, bruhad paraasara, Bruhathpati, Daksha, Saathaathapa, Likhitha, Vyaasa, Parasara, Sankha, Gouthama and Vasishta. Smruthies are also known as dharma sastra books.

ANALYSES OF DARSANAAS (VISIONS):
There are six darsanaas in Hindu dharma propounded by six great sages. Highly philosophical matters are discussed in these books. In fact every subject under the Sun has been touched upon in these small books. One can understand the darsanaas, generally, only with the help of commentaries:

Jaminee’s Poorva meemaamsa is the first darsana which explains the dharma and adharma and their merits/rewards and demerits/punishments.

Vedavyaasa’s Uttarameemamsa: This darsana describes the power/energy/universal soul known as Brahman which controls everything in the univers externally and internally. This is the basis of advaitha darsana.

Kapila’s saankhya darsana: Description on the composition of the universe is given as eight type of prakruthi including panchabhootha (five), intellect, mind and awareness/consciousness on the one side and the universal soul guiding and controlling all these within the system.

Patanjali’s yogasastra: detailed description of mind and body and the combination of panchabhootha (five) panchapraana, panchakarmendriya and pancha jnaanendriyas (five pranas, five sensory organs and five functional organs) is given in yoga.
Kanaada’s vaiseshika: Here the specific description on the atoms by which the universe is composed has been described. This darsana is specifically different from others in many ways, hence it is vaiseshika (special) darsana.

ANALYSES OF TWO EPICS:

Ramayana and Mahabharata are the two epics. Generally, Hindus know about these epics. Hence a detailed description is not required for this branch of literature.

Analyses of Ramayana: The first Hindu epic known as aadi kaavya, written in 7 kaandaas (parts) having more than 550 chapters. Through the history, Sri. Rama Avathaara of Mahavishnu, the human qualities are explained here. The Ramyana written in Sanskrit has been translated to almost every Indian languages and important world languages. The messages of life are conveyed to the common people through Ramayana, story telling, dance, ka:chakali, dance, and so on through out India and Indian continent.

Analyses of Mahabharatha: It is the history of Pandavas who were meritorious noble brothers and Kourvaas who were opposite in qualities to pandavaas. The sufferings and pains of Pandavas and finally how Lord Krishna advised to fight for reestablishing the dharma has been explained in the Mahabharatha story. It is said Sage Vyaasa has told, hence everything in Mahabharatha, nothing else remain to be told vyaasocchishtam jagath sarvam.

Thus in Hindu dharma the above books and their commentaries give the dharmonic messages. None of these books is to be blindly followed or their messages to be blindly practiced. They are only the guiding books, one can walk from one level to a higher level, from there to a still higher and then to the highest level. Till one realizes that he is also the embodiment of the divine power. That is Hindu dharma.
THE SCIENCE OF HINDU SPIRITUALITY

Hindu/sanaathana dharma has its foundation on scientific spirituality. Ancient Rishies are the authors of the Vedas, puranaas, itihaasaas and smruthies which are known as Hindu religious/spiritual books. Those rishies themselves wrote the books on economics – artha saastra-, music and dance– gaandharva Veda-, science of heath and food – ayurveda-, civil engineering and sculpture – shaapathyva veda, etc which are the well known scientific books. In all the ancient Hindu literature one can see that science and spirituality are integrated. It is mentioned in the 40th chapter of the Yajurveda known as Eesaavaasya Upanishad that ‘use the scientific knowledge for solving the problems in our life and use the spiritual knowledge for attaining immortality through philosophical outlook. Avidyaa amruthyam theerthwaa vidyaa amruthamasnuthe’. A detailed description on the scientific and technological heritage of Hindu dharma has been separately given and hence it is not included in this text. Here only the science of spirituality is described for giving a clear understanding on the Hindu way of looking into the different order/level of spiritual science.

At all levels in other religions there exist only one god/divine power. And that is the one and only one, without even a second on the pathway to attain that one. In Hindu dharma also there exists the ultimate one and only one god. But to attain that one, you can have different pathways and worship of different deities. For reaching New Delhi, the capital of India, there can be many pathways/roads, but New Delhi remains the (same) one location. Some of these roads may be short cuts, some may be smooth and some other may not have street lights, etc. Thus the roads and nature of roads vary but the ultimate goal remains the same.

The one Hindu god and its scientific explanation: There exists only one god and it is reiterated throughout the Upanishads and Vedas. Ekam sath vipraa: bahuda vaodanthy. The ultimate
truth is one and only one, but some scholars may tell that it is many fold. *ekam eva na dvitheeyam*. The only one without the second. Further you can see the words of Rigveda: *dyaaavaa pruthvi janayan deva eka*: the god, who created the celestial bodies and this earth, is one and only one. *Eka eva hi bhoothaatmaa bhoothe bhoothe vyavasthitaa ekathaa bhahudaa chaiva drusyathe jala chandraravath*. The ultimate divine power is one and only one which is existing in each and every living being. It may be said by some as one and some others may say it as many, but the truth is like this; there is only one moon and it is reflected in different waters (of river, well, a cup of water, sea or ocean). Just like the reflection of the one moon is seen in all, the same divine power is manifested in all living being. Even the whole philosophy of the advaita is based on the non duality of the divine power (advaita – the one without a second)

The name of ‘that one’ in Hindu dharma is Brahman or Brahmam. Hindus do have different levels of *upaasana* worship. But the ultimate point where all the pathways arrive at is this point of Brahman (do not pronounce Braahman). The Vedas say *Brahma sathyam jagath mithya*. The ultimate essence of everything is this Brahman and everything in the universe is the manifestation of that ultimate truth (which is the Brahman).

*Jeevo Brahmaiva na aparaa*: Even the life force / soul itself is the same Brahman and nothing else. The Brahman is present in everything, in the smaller than the smallest (in atoms) and bigger than the biggest (in the universe) and also present as the *jeevaathma* in all living beings: *Anoraneeyaam mahato maheeyaam aatma guhaayaam nihithosya jantho* says Mahanaraayana Upanishad. One can see pure science in this explanation: The revolution of electrons and the spinning of the nuclei in atoms, the rotation and revolution of earth, the solar system, the galaxy, and so on are all guided from within the system and this force which gives the energy and guidance for their movement is known as Brahman. It is this same energy manifested as *jeevaathma* in the living being which controls the heart, lungs, the liver, the
blood circulation, the sensory organs, the functional organs, etc. in animals. In the mahaasankalapa, it is thus explained achinthayaa aparimithayaa sakthyaa bryamaanasya aneka koti brahmaandaanaam madhye; the billions and billions of galaxies which are revolving/rotating under the torrential force which is beyond the level of imagination and limitless … this force is from within the system and it is the one which guides the rotation and revolution. Hence the ancient Indian Rishies said that Brahman is the ultimate force/energy. Upanishad says that the Brahman is the one which can not be seen through eyes, heard by ears, analyzed by mind but the energy which is responsible for the proper functioning of the eyes, ears and mind…. Is Brahman. yath chakshushaa na pasyathi yena chakshoomshi pasyathi……., yath srothrena na sruthothi yena srothra mitham srutham……., yath manasaan na manute yenaahur manomatham……... thadeva Brahmathwam viddhi yadidam na idam upaasatethe. is the Brahman and worship that Brahman. In other Upanishads it is explained that the fire and air (prathyaksham Brahma), the sound (sabda Brahman), the Sun, the light (chaakshu Brahman), and so on are all the manifestation of this Brahman. This gives a clear definition for Brahman that it is the energy and manifestation of a power

Brahman is also present as jeevathma soul in me hence I say aham Brahma asmi (I am the divine power) It is present in you hence thath thwam asi (you are also the same divine power) It is present as life force hence ayam athma Brahma (this life force/energy is the Brahman) and it is manifested as the inherent intrinsic consciousness and awareness, hence prajnaanam Brahma (that glorious knowledge is Brahman). These four sets of words corresponds to Yajurveda, Saama veda, Atharvaveda and Rigveda respectively, are known as four Mahaavaakaayas). The yogi who could get the experience of the realization of the Brahman is known as Brahma jnaani and the process of realization is known as Brahma saakshaathkaaram. That state of Brahma jnaani is also known as kaivalya state, the state in which one
knows that only one is existing \textit{(kevalam} means only one). \textit{Aksharam Brahma paramam} means the Brahman is non destructible for ever. \textit{Brahmakshra samudbhavam} Brahman arose from the non destructible. There are few vedic and \textit{puranic} words connected with Brahman, they are \textit{Brahmaandam} (the universal egg – a state before the big bang) Lord Brahman (the creator of this universe and everything present here from energy) \textit{Brahma vaivartham} (the manipulation and manifestation of the universal force/energy).... Now the word \textit{Brahman} may be clearly defined based on the above explanations using modern science as follows: the intrinsic, inherent, self guiding, self motivating, self awareness and self conscious present from each and every atom to the universe itself, is the Brahman, the ultimate god of Hindu!

It is said that there are two states of \textit{Brahman}. The extremely active state in observation known as \textit{saguna Brahman} and the inactive state in observation known as \textit{nirguna Brahman}. These two states are complimentary and never contradictory (as few scholars may say). \textit{(saguna and nirguna} may be opposite words just like lower and upper are opposite words. But lower primary and upper primary are not opposites, they are complimentary). In an atom, the electrons are revolving at a fantastic speed/velocity \textit{(sagunathwam)} but the materials which are composed by the atoms are seen in \textit{nirguna} state (without rotating and spinning). The earth rotates and revolves at high speed \textit{(saguna} state) but the people living on the globe earth do not feel the speed \textit{(nirguna} state in observation). Our heart/liver/ lungs/ each and every tissue functions/ works for all the 24 hrs \textit{(in saguna} state), but the body does not feel that (particularly when sleeping) such a series of biochemical processes are going on inside \textit{(nirguna} state). Thus there are observationally two states for the Brahman one \textit{saguna} state and other \textit{nirguna} state. Sometimes \textit{saguna upaasana}/worship also means the worship in forms and images and \textit{nirguna upaasana}/worship means worship without keeping the images.
From the upanishadic explanation that the universe is filled with the *Brahma chaithanyakam* (the intrinsic... awareness and consciousness) it may be difficult for a common man to understand this concept. For the understanding at a lower level and for giving a better perception for common man, the Brahman has been symbolically presented as a personified form of *prapancha purusha or viswa roopa* (*prapancha* — univers; *purusha* — human form *viswa* — univers, *roopa* — size and shape). This is a concept and symbolically presented, hence it is well defined as *prapancha purusha sankalpa* (*sankalpa* — concept). It is narrated as *viswaakaram gagana sadrusam megha varnam*... having the size and shape of the universe, similar in area to the sky itself and colour that of clouds.... It is described in Vedas as *viswathaschakshurutha vishwatho mukho viswatho baahurutha viswathaspaath*... its face, brain, hands and legs have spread over the universe and everything in the universe works under his guidance and control. Bhagavath geetha gives the power of *viswa roopam* like *divi soorya sahasrasya bhaveth yuga pathutthithaa*... it looks as though thousands of Suns are blazing. The size of the *prapancha purusha* has been explained *na antham na madhyam na punasthavaadim* : there are no beginning, middle and end for that *viswa roopa*. Lord Krishna himself tells in Bhagavath geetha for seeing the universal person/*viswa roopa*, one needs the divine eyes (*divya chakshu*). Vedas describe it through *purusha sooktha*.

This *viswa roopa / prapancha purusha* is known in *puranas* and other literature (some times in Vedas too) as *Mahavishnu / Vishnu* and *Naraayana*. *Puranas* give detailed narration for *Naraayana*.

At further lower level there exists a trinity concept in Hindu dharma. The trinity concept of Hindus is different from that of other religions. Here the ‘controllers’ of birth, existence / growth and death are symbolically presented in human forms as *Brahma Vishnu Maheswara – trimoorthy sankalpa* in which the universal laws of life cycle are symbolically presented. *Mahavishnu* is the base for the trinity concept.
Explanation for Mahavishnu: The blue colour of Vishnu denotes the colour of the sky and ocean which means the infinity/limitless. The serpent on which Vishnu is lying denotes the coiled structure of galaxy. The name of the serpent anantha means limitless (infinity) the ksheera saagaram (ocean of milk) on which Vishnu is pictured shows milky way galaxy. Anantha sayana represent the silent universe/galaxies. Symbolically Mahalakshmi (meaning of this word is prosperity) has been attributed the position of the wife of Mahavishnu showing that any system can smoothly exist only with prosperity.

From Mahavishnu comes out through a Lotus (symbolically) the creator Lord Brahma. This symbolically presents a connection of Lord Brahma with the prapancha purhsa similar to the connection of the baby in the womb of the mother. The baby takes the energy and nutrition for growing/cell production from the mother. Similarly Lord Brahma takes energy and material from for creation in the world. The four heads of Lord Brahma represent the four axes required for any creation: x, y, z and time axes. The Vedas (the word itself means knowledge) in the hands of Lord Brahma and the position of Saraswathy (deity of knowledge) as the wife of the creator symbolically present that for every creation knowledge/vidya is required. The knowledge and creation (knowledge for creation) are inseparable components.

Lord Siva is the deity symbolically presents the controller of death/destruction (the destruction is for further construction). Mahavishnu and Lord Siva are said to be connected through hearts (which only means inseparable) Vishnoasya hrudadayam siva: Sivosya hrudayam vishno – says Upanishads and Yajurveda. Symbolically Lord Siva has powerful fire in the third eye, powerful water and torrential air symbolically tied in the tuft and the snake around the neck (symbol of international medical association) and thri sool in hand. All the five respectively present destruction through fire, water (flood, etc) air (cyclone/tempest, etc) diseases and using weapons. Parvathy (means
energy/force/sakti) is symbolically presented as the wife of Lord Siva. Through this combination of Lord Siva and Parvathy, it is shown that the destruction for construction can take place with powerful application of any one or more of the above five. (powerful fire, air, water, diseases and weapon only have the destruction capacity). Thus they become inseparable hence the concept of Ardhanaareeswara comes up. In fact the Brahma Vishnu Maheswara sankalpa and the Lakshmi Parvathy Sarwathi sankalpa are the symbolic presentation of the life cycle at spiritual-social and physical level when scientifically explained. Always the Hindus consider the knowledge, prosperity and sakthi/power in feminine gender. These explanations (of the gods) are the connecting layers of Vedic and puranic concepts of gods.

Further going at common mans level, the above six deities can be seen in different roles of puranic stories to convey the message of what they represent symbolically in. However these stories are mainly for conveying the values and universal truths in our life. And they are meant for the understanding for less educated common man who may not be in a position to understand the Brahman or prapancha purusha concept, or the symbolic message of Hindu trinity concept, etc.

About other deities: In puranas one can read the stories of Vigneswara having the shape of the cross section of human brain, worshipped as the Lord who removes/protects from the hurdles in the life. Hurdles can be as huge as elephants and it can come from anywhere just like a rat (mooshika vaahana) comes. Students who learn the six branches of Vedic subjects Siksha-niruktavyaakarana-chandassastra-kalpasastra and Jyothisha, worship Subrahmanya/Muruka, Subrahmanya is given the Lordship of six subjects. Hence six heads one for each subject. Incidentally, I feel it is worth explaining here that Ravana is said to have ten heads. It is because Ravana has the capacity of ten heads (he has learned the four Vedas and six Vedangas and even he had tried to master the 11th subject, the Ayurveda too). Yamadharma
raja or Kaala is the controller of death. Yaama and Kaala (yaamasya apathyam pumaan yama: and kaalasya apathyam puman kaala) both means the controller of time. Hence the names clearly give the scientific truth that the death is connected with the time. Kaala is symbolically presented coming on a he buffalo ( he buffalo is said to be the most senseless animal, hence the time of death arrives to us senselessly – and takes our breath without looking the age, religion, sex or any other parameters of the individual – we say people die just like that).

Lord Krishna and Lord Rama and many heroes of the puranas and epics give us the message for elevating ourselves from the ordinary human level to the level of incarnation/ avathara. Their message enrich our life. They stand as role models in our life. Hence they are worshipped and celebrated as avatharas. In Hindu dharma none is a sinner. Hence everyone has the opportunity to elevate/ rise himself to the level of god. We say krinwantho viswamaaryam; (God will not get jelous of you if you are getting the level of god himself, in Hinduism). Let us convert the world into a great men’s abode. Human being is considered as the children of immortal ..amruthasya putra: Every deity in Hindu dharma has a connected animal, bird, tree, flower, celestial body or planet (as adhivedatha or pathyadhivedatha), colour, metal, medicine, manthra, gayathri, letter, dhyaana manthra, moola manthra, ...etc. This gives an excellent message that these are to be protected. In Hindu dharma there are 33 crore (koti) devaas! The meaning of this statement is very simple but wrongly understood. Koti means part (not ten million) and here 33 parts devaas (people with divine qualities) 33 parts asuraas (people with demonic qualities) and 33 parts maanavas (people with ordinary human qualities) – it is just like we say 1/3 of the human beings have divine, demonic and ordinary human qualities each. It is said that Hindus worship everything! True in everything we can see the divine power and that divinity could be felt when we elevate ourselves into that level. Even a stone/ wood/ photo/image becomes an idol archakasya prabhavnaa sila bhavathi
sankara (by the proper method of worship by a priest/devotee even a stone can be converted into Lord Siva /Sankara/vigraha/idol. Archakasya aprabhavena siva bhavati sila, by the improper outlook/method of worship even the god itself will become a stone.

Hindus worship in temples. The temples are not merely prayer halls for Hindus, they are the quantum healing centers (kshayaath thraaythe iti kshetra). In temples the light, heat, sound and chemical energies are filled through lighting the lamp, camphor, keeping mirrors, etc. The sound energy through manthra, ringing of the bells, musical instruments, bhajans etc. The chemical energy is from bathies, aromatic flowers and leaves etc. Thus the temples are energization centres in Hindu way of worship. A devotee has to stand for few minutes in the temple environment in front of the vigraha/idol with sareera (body), mana (mind), aahaara (food), vaak (words/talking) and karma (deeds) suddhee (purity) for energisation.

Hindus never allow the cremation or burial of human body in the temple premises Hindus always keep the idols or images having smiling faces (Prasanna vadanam dhyayeth- meditate on the god having smiling face). Hindus never place the sad/crying faces or bleeding bodies for worship. The offerings of the gods, from the temple are taken as shared prasadams not as body or blood of the gods. Hindus never pray for unloading/transferring their sins to the god or representatives of god or saints. Using the concept, that the sins are transferable to someone who is a representative of god and punishing him for our sins is not existing in Hindu dharma. But Hindus pray for guiding through correct and dharmic pathway so that one can prevent committing the sins (thamaso maa jyothismaya,....etc) Hindus never pray to god through intermediate saints, they submit directly their prayer. The people who fought for spreading the religion using swords and bloodshed and denigrated other religions are never elevated to the level of saints. The offering given to temples are not the bribes to gods but for pancha yajna- the offering for gods Deva yajna, Rishi yajna – for sages, Pithru yajna - for forefathers,
bhootha yajna - for all other living beings and Manushya yajna for feeding the poor people. The idol and temple are compared with human body (idam sareeram kountheya kshetramithyabhidheeyate) and human dwellings. Hence whatever are required for human body are performed through thaanthric way to the idols also. In olden days the temples were the capitals of the villages, through them the food supply, education, help for the society, legal consolation, counseling, marriages, etc were given/ performed. The priest hood of Hindu dharma and that of other religion are entirely different. The role of the priests was not political at all but to advise on dharmic and spiritual way. Hindus are never god fearing, they have only devotion to god not fear ( daiva bhakti and not daiva bhaya). There are five bhavas for the bhakti – saantha bhaava, daasya bhaava, sakhya bhaava, vaalsalya bhaava and maadhurya bhaava. In all these the question of fear does not arise

Additional points to remember: Hindus worship the fire, air, the Sun, the celestial bodies, etc because they are all the parts of the prapancha purusha. The same reasoning is given for the worship of mountains, earth, rivers, etc. Hindus worship animals and plants and in fact every deity has a plant and animal associated with them, because all of them have jeevaathma / life force in it. Hence they are considered as divine in nature (jeevaathma is a part of paramaathma). The Vedic way of worship is through havans/ offering through the fire. The puranic way of worship is the temples and idols and images. Every temple has a specific vaastu connected with it and that vaastu resembles the yaaga saala/ house of yaagaas and fire altars. Hindus say Vedas are holy because it gives absolutely (no stories) the universal laws and truths. Anyone can learn Vedas and there did not exist a rule that people belonging to only one caste can learn Vedas. For keeping the seriousness and for strictly following the rules, the scholars defined that who has Brahminical qualities only can learn Vedas, which can be acquired and not obtained by birth alone. All the Rishies who composed Vedic manthras were not Brahmins, Sri Krishna or Sri Rama were not Brahmins. Many
ancient Rishies and many of those Rishies who are living even now are not Brahmins.

Hindus worship books/letters/ because it is the base for knowledge. Hindus worship the tools and instruments during aayudha pooja, by performing pooja once in an year because tools are the lively hood for human beings. Hindus have given the status of divine power to many phenomena like: the Sun, because it gives light and heat for all living beings; the air, because all living beings are surviving because of it; the water, because without which life is impossible; the earth, because it is where all the life is surviving (not only that they are all parts of prapancha purusha); our parents, because they gave birth for us and they are our creators; plants and trees, because they provide us food, and so on.

The Hindu way of life is different from that of the followers of other religions. Learning and practicing Hindu dharma should be done directly and it is an experience. All the Hindu way of life is through customs and rituals. It is always advised to follow the relevant and scientific customs and rituals which are beneficial psychologically, physiologically, family based relation and social relations strengthening and also for national integration. All this customs and rituals put together is known as sanaathana dharma hence it is said Hinduism is not a religion but a way of life. Hindu dharma get refined continuously by the Rishies, hence any superstition comes into the Hindu dharma, Rishies like Lord Budha, Jain, Sankara, Madhwa, ....... They refine and make it more powerful........

Thus says Lord Krishna in Bhagavath Geetha: Whenever the dharma comes down and adharma takes an upper hand, the god himself will do the needful for the uplift of Hindu dharma. He will protect the nobles, punish the bad people and protect the dharma. Perhaps that is the reason why even after more than one thousand years of foreign invasion, massacre, destruction, plundering and looting by the foreigners, this dharma did not perish. It is fast spreading throughout the world particularly in the
developed world. Let us all learn the basic principles and
application of those from the Hindu dharma scientifically either
for practicing it or for challenging it.

**SCIENTIFIC AND TECHNOLOGICAL
HERITAGE OF HINDUS**

This is only an outline on the scientific and technological
heritage of Hindus to be selected for the study by the individuals
depending on their own interest and specialization. They may
collect as many points asking the questions why? how?
when? where? what? and comparing the answer with the
knowledge existing in other parts of the world, in each topic,
so that they can learn thoroughly and teach others. Let us
try to become an expert in selected and specialized areas of
Indian scientific heritage. The syllabus are given Italian
subject wise.

Example: If in the syllabus Ajantha Cave temple is given, ask
the questions what are the novel points with Ajantha cave temple?
when was it constructed? how it was constructed? what are the
salient structural features of Ajantha? How the people in other
parts of the world were living during when this Ajanta cave
temples were constructed (BC 50)? What was their capability in
this subject area of cave structure construction?.....Ask these
questions and find out the answers. Repeat the same for other
syllabus points.

**BIOLOGICAL SCIENCES**

Health science (Health science is a part of ayurveda which is
an upaveda of Atharva veda. It is also discussed in yoga sastra
which is one among the six darsanas of the Hindus. The subject
has also been dealt with in puranas and itihasas): The Indian
vision on health is given by Maharshi Susrutha, Charaka and
Vagbhatachaarya and many others. The approach taken by
Patanjali in Yoga sastra, the spiritual approach of body and mind,
etc will be the part of the Indian health science. Aswini devatha
concept of hitha aayaasa and mitha aahaara (food & exercise), need of appropriate exercise based on the age-sex-physiological conditions, etc. Yogaasanas, soooryanamaskaara, effect of medicines, identification of diseases through saastram pramaanam/ aaptavaakyam pramaanam/prathyksham pramaanam/ anumaanam pramanam / methods. Use of drugs, fastings and pathyas and fasting as a part of customs/rituals. Selection of foods based on climatic variation/age/health conditions/etc of the person/patient, physical and mental rest, upaasana and worship as a part of day to day life, ethics and morality in the common man’s life and also for doctors, ... cause of illness, pathogenic organisms, precautions to be taken for good health, solar therapy, music therapy, Yoga therapy, Reiki, energy healing, water therapy, as described in the Indian system. The knowledge on surgery plastic surgery and surgical equipments known as sastras and yanthras as described in Susrutha samhitha, practising surgery as given by Maharshi Susrutha. Variety of acharas/customs and rituals influencing the health. Importance of vegetarian foods. Indian traditional foods and their merits. Taking oil bath during selected days, hot/cold water bath. Allowing children to play in the soils after smearing the oil. ‘Grandmaa’s technological foods’ and baby health care system’ existed in ancient India.

Mental Health / Psychology (this is a subject of ayurveda and yoga/ poorva meemamsa/uttara meemamsa/vaiseshika/ darsanas and Upanishads. It has been discussed in detail in Yogavasishta, Bhagavath geetha, dharma sastra and so on): Description of mind given in Upanishads, mental influence on health, the influence of yamaas and niyamaas: ahimsa- satyam-astheyam-brahmacharya- aparigraham- soucham- santhosha-thapa- swadhyayam- eeswara pranidhaanam –etc. Effect of stabilised vision on life, controlling the anger,fear, and attachment, mental preparations to face ups and downs/loss and profit/ success and failures/ animosity and friendship/ appreciations and criticisms ...as described in Indian philosophical books. Influence of puranic / epic related stories in mind to face the realities of the life.
Influence of pranayam/dhyaana/dharana etc on the mind. Impact of food on mind as proved by the modern science, effect of sattvic food, dreams, effect of mantras on mind, customs influencing the mental health and family relations. Analyses of the purpose of living, family-social-and national goals to be put forth for a purposeful life and its impact on mind. Spirituality and faith in healing. Effect of curative chemicals on mind and body. Bhajans/keerthans/prayer/mantras, etc on mind. The positive songs and images influencing the mind. Psychologically influencing acharas.

Food science (very specific explanations are given in ayurveda— a part of atharvaveda, dharma saastras and gruhyasootra (part of kalpasatra) and to some extent in puraanaas): Variety of Indian foods, balanced nutritious foods, natural traditional baby foods, the medicinal components usually added in Indian foods (like asafoetida, turmeric, spices, mustard, etc), pathya based food during illness, specialized cooking, roasting, fermenting, processing, preserving, etc. done for variety of foods and their science. Generation of specific flavors in foods by suitably modifying spices. The science of altering the foods during fasting on specific days like ekaadasi/somavaar vratha/karthika month/vaisakha month/etc. Opting for integrated balanced foods through fasting and vrathaas, importance of selecting cooking vessels like ceramics/iron/copper/brass vessels (for getting micro nutrients like, iron, zinc, copper, silica, magnesium, sodium, potassium etc), variety of vegetables and their significance in balanced healthy foods. Many more significant scientific observations can be made if a student carefully examines the Indian food, naturopathy and vegetarian food.

Chemistry (Rasachikitsa is a part of ayurveda prevalent in north India. All the authors of Rasachikitsa were Siddhas or Maharshies. The chemistry descriptions, are given systematically in the rasa books): The ancient Indian chemistry books like rasamava, rasaratna samucchaya, rasendra chooramany, rasarnavakalpa, rasa chandrika, rasaratnakara, and hundreds of
rasa based books. (These books are available in Sanskrit with English or Hindi translations.). The knowledge on chemicals, particularly in inorganic chemicals like sulphides/ sulphates/ oxides/ etc. Sanskrit names of chemicals, detailed description given for setting up a laboratory, scientific temper, qualification of laboratory assistants, research scholars as described in Rasaratna samucchaya, properties of inorganic chemicals and their used described by Vagbhatacharya, centuries ago. Chemicals used for various purposes as described by Bharadhvaja in yantra sarvaswa, Varahamihira in Bruhath samhita and also by others in the above chemistry books.

Bio-pesticides (biopesticides are part of vrukshayurveda which again is a part of Ayurveda or Bhruhat samhitha): Variety of plant products, neem, sweet neem, neem cake, mustard cake, tulasi, clove, pepper, turmeric, tobacco, oils from sesame, cotton seed, castor etc., used as bio pesticides and as preservatives. Traditional methods of pest control like fumigation with neem/ sulphur/ camphor/ coconut husk (since it contains sulphur/coconut shell (raw- for its phenolic content) / cow dung (since it contains ammonia). The use of panchagavya / aqueous cow dung filtrate /extract as pesticides. The traditional knowledge available from farmers. Detailed descriptions for controlling the pests/microorganisms/etc given in Vruksha ayurvedic books.

Plant drugs/pharmacology (this is also a part of the atharvavedic ayurveda): Active plant bio-chemicals possessing medicinal properties, as described in Charaka samhita, Ashtanga hrudaya, ashtanga sangraha, sahasrayoga, etc. comparative studies on modern and traditional knowledge of medicinal plants. The student can try to understand as many plants as possible which are good sources of the bio-active principles. Variety of plants (herbs, shrubs, creepers, grass, trees, etc.) used for curing diseases. The plant leaves, buds, flowers, stems, roots, latex, etc. used for treating specific diseases. Single drug treatment.

Medicines and medicinal preparations/plant biochemistry (Charaka samhitha and Susrutha samhitha are written by
Rishies having the caliber of those of vedic Rishies. This also include the name of sages like Chyavana/Brugu/Vagbhata/Agastya and so on): The descriptions of inorganic chemicals used as medicines in ancient Indian Rasa chikitsa books, their preparations/processing and preservation. The plant products used as drugs, the raw drugs, their harvesting, drying, storage, mixing, drug formulation, decoction preparation, etc. Variety of Ayurvedic drug formulation obtained by mixing many raw drugs. Knowledge on the possible chemical changes taking place in ayurvedic drug preparation while drying, storing, heating, roasting, boiling with water, concentration, etc (all ayurvedic preparations). Here we have to focus only on the knowledge existed and their scientific merits, in the area of plant drugs. The scientific knowledge behind kashaya/decoction preparation, choorna, kwatha, lehya, arishta, ghrutha, thyla. etc Preparations and their basic principles applications.

Basic plant sciences/botany: Detailed description given in Vrukshayurveda by Rishies like Saarngadhara, Katyayana, Varahamihira, Parasara, and others. Plant growth, grafting, irrigation, use of manure, seeds preservation, phototropism, agricultural practices both basic and applied. Seasons of sowing/planting/biodynamics of agricultural practice, etc., Variety of the traditional knowledge still practised in villages, in the production of agriculture commodities.

Fermentation technology. The knowledge of microorganisms existed in India as described in ayurvedic books. Fermentation of milk to curd and yoghurt, fruit juice fermentation to vines, medicinal preparation of arishtas, etc. Fermentation procedures followed in four major types liquors mentioned in Chanakya’s Artha saastra (Arthasastra is an upaveda of Rigveda), the source of microorganisms, cultures, fermentation products mentioned in the ayurvedic and vrukshayurvedic books. Fermented rice based common solid foods like pan cake, fermentation of traditional liquors from coconut and palm products are the examples.
TECHNOLOGICAL SCIENCES

Ancient Indian mines: Knowledge on the ancient Indian mines which were active during the last three or more millenia, the ores/ minerals of copper, gold, zinc, lead, silver, distributed throughout Rajasthan, Haryana, Bihar, Bengal, Gujarat, Karnataka, Uttar Pradesh, Madhya Pradesh, etc.... The technology adopted for digging mining, transportation, processing and refining the above ore prior to metallurgical processing, provisions given for aeration and lighting in mines, the present day scenes of ancient metallurgical sites.

Ancient Indian knowledge in Metallurgy (metallurgy is a part of lohathanthra which again is becoming a part of Rasachikitsa/sastra): The production and purification of metals, the use of flux and slag, temperature attained, technology for the production and purification of metals like tin, copper, iron, silver, gold, zinc and lead. An understanding of the chemical reactions accomplished like, oxidation, reduction, slag formation, distillation of low boiling metals, etc. The fine technology used for the large scale production of bronze, brass, panchaloha, bell metal, coin making metals and many alloys as mentioned in chemistry books and also in the books like Chanakya’s Arthasastra. Impressive metallic alloy preparation techniques mentioned in the Rasa books like Rasopanishad and Bharadvaajaa’s writings. The kilns and mooshas used for the metallurgical applications. Special methods adopted for the preparation of zinc and lead. Preparation of the purest form of copper and alpha and beta brass. Identification of alpha and beta tin and descriptions of the physical characteristics of these metals. The metal ingots, sheets, plates etc. of zinc/lead/iron/brass/bronze/copper/gold/silver/...of ancient Indian origin excavated from other countries like Athens, Babylonia, Rome, Egypt...
Making the swords, the Banaras and Kodumanal swords, carburization in iron instruments used in agriculture and surgery. Rust free preservation techniques adopted for iron, woortz steel. Large scale production of iron alloys, export of iron to European/middle east countries. The iron technology existed in North Kerala/Andra/Nasik/ Gujrat/Bengal/Varanasi/etc. the Damascus sword from India.

Ceramics science and technology in ancient India (detailed description of the moosha as given in Rasa based books) : The top quality ceramics vessels, tiles, glazed vessels, beads, bricks etc. produced in Harappa, Mohanjo daro, Lothal, Varanasi, Thakshasila, Kalibhangan, Hastinapura, and many other North and south Indian archeological sites. Variety of coloring materials used for the ceramics vessels and decoration ceramics articles which were also used in the glass making. The ceremics floor of great bath of Mohen jo dara, the lost city of Cambay, Dwaraka, Hastinapura, etc

Industrial and instrumental glass technology existed in India: Variety of multi colored glasses with different size, shape, appearance and capacity produced in India. The glass beads, ornaments, plates, vessels, made using variety of inorganic coloring materials like the oxides, carbonates, sulfates, phosphates, etc of chromium, lead, copper, iron, nickel, calcium, sodium. The non metallic compounds used as coloring materials. Technology for introducing the golden/silver leaf/plates in glasses.

General Instruments used in ancient India: Description of a variety of instruments given in Bharadvaja’s yantra sarvaswa (Bharadvaja is now a clan ordered after the great Vedic sage of Bharadvaja. He is known as Maharshi Bharadvaja. Only a part of his book Yantra sarvaswa/amssubhodini is now available) the Vaimanika saastra, dvaantha pramapaka yantra, etc. The numbering systems with serial numbers of the components of instruments, alloy preparations, quality of glass lenses, prisms, glass plates, variety of Krithaka loha, (artificial metallic alloys having non
metallic compounds also) dies used for molding the instrument parts/components, in required size and shape. The instruments used in astronomical calculations known under the title jyothir yantra.

Musical instruments (Music is Gandharva veda which is an upaveda of Saamaveda. Music/ dance/ drama/ musical instrument are all originated from Saamagaana): Variety of string instruments for music/dance performances, the metallic alloys used for the preparation of strings, wind instruments, the knowledge of sound waves, the membrane instruments, preparation/processing of the membranes for these musical instruments. The basic knowledge of sound in music. The granite music pillars known as sangeetha mandapa seen in ancient south Indian temples. Traditional Indian musical instruments like flute, idakka, mrudanga, chenda, thaala, naadaswara, veena, violin, harmonium, and so on. The basic principles adopted in their making and use.

Surgical instruments (detailed description of these instruments and their pictures are given in the book written by Maharshi Susrutha as a part of Salya chikitsa which is a part of ayurveda/ upaveda of atharva veda): The surgical instruments known as sastras and yantras numbering more than a hundred, as mentioned in Susrutha samhitha, the metals used for making these instruments, their size, shape and comparison with the modern instruments used for the purpose. Description of plastic surgery techniques. The instruments used for kidney stone removal, stitching, cutting open, etc. all these instruments used in the modern surgery may be compared with those available in India thousands of years ago.

Laboratory equipments (this description is coming as part of rasa books): More than 35 types of ceramics, glass and metallic equipments are mentioned in Rasaratna samucchaya for the use in chemical laboratories for the processes like, distillation, sublimation, extraction, drying, heating, roasting, mixing, decanting, etc. They are generally known under the name yantras
made using specific quality clays. Many varieties of mooshaas, putas yantras were also used here for processing the metals and other compounds.

Kilns/furnaces, mushas & putas used for metallurgy. Variety of furnaces and kilns, crucibles were used for the production of various metals and alloys. The high temperature attained for oxidation, reduction, slag preparation and distillation of variety of metals and correspondingly suitable selection of putas/furnaces. Heating materials and their proportions, heating time, flux used for removing the impurities in the metal processing, description of maha gajaputa, gajaputa, kukkuta puta, kapotha puta ……etc and their preparations.

Painting Technology/organic and inorganic colorants (this subject is coming as part of sthaapathy a veda/architecture which is an upaveda of Rigveda. Sometimes it is also said as the upaveda of Atharva veda). The chemistry of the paints used in Ajanta, Ellora and other cave temple paintings, mural paintings, the inorganic colors and organic plant products for paintings, their preparation, mixing, applying on the preprocessed surfaces. Selecting and processing plant products used as paints. The preparation of inks, for variety of applications. Mural paintings, oil paintings, preparation of painting beds/ walls/ canvass, etc as done in cave temples and walls.

Textiles technology (detailed description can be seen in dharma sastra and artha sastra which are part of either kalpasastra or upaveda): Ancient Indian textile industry as mentioned in Chanakya’s Artha saastra, textiles produced using cotton, silk, wool, jute, and also incorporation of gold, silver and lead metallic threads as boarders for the textiles. The famous Kancheepuram, Banaras,.. sarees/textiles. the dying technology and coloring materials used. The textile dyes, leather colors, variety of coloring materials produced in different parts of India and method of application of the dyes.

Civil engineering and architecture (The subject matter is dealt with systematically in Sthapathy a veda which is upaveda – as mentioned above. Detailed description is also available in
artha sasstra books): The civil engineering skill demonstrated in the famous south Indian temples constructed by the kings of the Chola, Chera, Pandya, Hoysaalsa, Kakateeya, Vijaya nagara...periods. The huge and tall entrances/gopurams of these temples. The mortars/cements used for the construction of these temples. The instruments used for measuring/maintaining the geometry of these structures. The granite/marble/laterite stone cutting and polishing equipment/devices existed during then. The transportation techniques adopted for the huge granite pieces. Construction of marble temples, palaces and lake palaces in Rajasthan. The temples of Kancheepuram, Rameswaram, Chidambaram, Kumbhknonam, Thiruvannamalai, Sucheendram, Trivandrum, Konark, Khajuraho,... The music pillars and music mandapas, the knowledge on the sound waves produced by these granite pillars and granite stone carvings. The carving work undertaken with top precision, in all the above structures.

The construction of cave temples of Ajanta, Ellora, Elephanta, knowledge on geological aspects of rocks in which the Chaityaas and Viharas were carved out. Huge palaces constructed particularly like Jaisalmar palace, palaces in the pink city of Rajasthan, Gwalior, Mysore, Hyderabad, etc. The air conditioning/temperature maintaining mechanisms adopted, glazed and non-glazed tiles/glasses used for flooring/windows. The ponds and water reservoirs made thousands of years ago. (look into as many structures constructed as possible and their technologies)

The civil engineering sciences and technologies of forts and walls, channels, rivers, etc. the archeologically important sites of Mohanjo daro, Lothal, Harappa, Dwarka, the lost city of Cambay etc

BASIC SCIENCES:

Basic principles of physics (for these basic principles one has to search many books; examples are sited against each subject) the velocity of light (Sayana Bhashyaa for Vedas), wave nature of sound (Maharshi Gouthama’s nyaaya saastra), seven colors of light (Rigveda), Heisenberg’s uncertainty principles Patanjali’s yoga sastra), definition and explanation of atoms,
gravitational forces (siddhanta siromany of Bhaskaracharya II), different types of rays (UV, IR, Heat rays, visible rays - as explained by Bharadvaja) lenses, prisms, magnetic materials like iron and variety of magnets. Time, weights and other measurements, linear parameters. Modern scientific principles and their equivalent ancient observations. Explanations given in yantra sarvaswa of Bharadvaja, the vaimanika saastra, dwanthapramapaka yantra/spectro photometer, etc the scale used in measuring the temperature, the serialization of instrument parts commonly used, graduation method adopted, metallic alloys used in measuring the light waves, etc (all from yantra sarvaswa of Maharshi Bhardvaja)

Ancient Indian Mathematics & Astronomy (Mathematics and astronomy are the fifth vedanga of vedic literature kown as Jyothisha. There are four vedanga jyothisha connected with Rigveda- archa jyothisha, Yajurveda - Yajusha jyothisha, Samaveda samajyothisha and Atharva veda - Atharvanya jyothisha). The later development of the subject matter are directly connected with these jyothisha books) : Detailed explanations are given in the books written by Aryabhatta (I & II), Bhaskara (I & II), Vateswara, Manjula, Lalla, Varahamihira, Parameswara, Sankaranarayana, and many other mathematicians. The four number systems, (Sanskrit number, Aryabhatta number, Bhootha sankya and Katapayaadi number) arithmetic and geometrical progressions and their variety of applications, interest calculations, moving bodies, forward and backward motions, linear and angular measurements, number theories, square/cube roots and power series, determinations, degree/minutes/seconds/microseconds both for time and angular measurements, various geometrical figures both inscribed one another and independent figures, parameters connected with area, perimeter, volume of squares, triangles, circles, trapeziums, spheres, cones, cyclic quadrilaterals, polygonals, detailed algebra, quadratic equations, monomial and binomial theorems, etc. Hundreds of theorems developed by Aryabhatta, Bhaskara I & II, Sankaranarayana,
Sangamagrama Madhavacharya, Puthumana Somayaji, Vateswara, Aryabhatta II, Sankara Varman, Parameswaracharya...... the application of kāta pāya adi number and bhootha sankhyā systems made by the above mathematicians.

Determination of Sine, cosine and tangent, Rsine values their squares, square roots, additions and subtractions, determination of angles at degree/minute/second levels. and their tables, as explained in detail by Varahmihira/ Vateswara/ Aryabhata II/ Puthumana Somayaji/ Parameswaracharya/ Nilakanta/ Sankaranarayana/ Achuta/ Jayadeva/ Manyulacharya/ and so on, method of determining these values, angles in degrees and radians, calculations and theorems connected with these values. Relation among radius- arc-chord-circumference - sine - cosine - tangent - angles. Indian theorems known in foreign scientists names such as: Newton’s theorems, Gregory’s theorems, Kelvin’s theorem, Lhuilers theorem, Lebnitzs’ series, Taylor series, Tycho Brahe equations, etc.

Astronomical parameters (As mentioned above; Jyotishasastra is applied ganithasaattra according to the fifth vedanga known as jyothisha): Various astronomical and geographical parameters mentioned in the above books: The spherical shape, size, diameter, circumference, gravity, declination, rotation speed, revolution, celestial/terrestrial latitude and longitude, parallax in latitude and longitude, earthsine, etc of earth. Many more astronomical parameters described with definition by Vateswaracharya, like co-latitude, prime meridian, and its relation with time. Sun rise and sun set, eight type of revolutions of planets, visibility of planets, declination, precision equinox, alpha Aeries point, apogee, perigee, solar and lunar eclipse, calculation of eclipse, diameter of shadow and movement of shadow, instruments used for time calculation and also for the calculation of various astronomical parameters known as yantras.

Hundreds of parameters described systematically and calculated mathematically on solar and lunar eclipses, changes in the signs of latitude/ longitude, time variations, east –west lines, avanti lines of international importance, the inferior planets and superior
planets, occulting of planets and stars, the star constellations, the comets, and their appearance, etc., etc.

Indian Management science (All Indian management books are directly connected with Itihasa( epics) puranas, and subhashitas): Thousands of model and relevant management principles are explained by Chanakya in (Chanakya) neetisara also known as Chanakya upadesa, Bharthru Hari in upadesa sathaka in hundred points, Vidura in Vidura neetisara as a question answer method of presentation between Dhrutharashtra and Vidura, Bhishma in Bhishmopadesa to the questions asked by Dharma putra,, and also books like Yoga Vaasishta as given by Maharshi Vasishta, Bhagavath geetha advise given to Arjuna by Lord Krishna, Sukra neeti sara by Sukra muni and many subhashitaas (advises) mentioned in Pancha thantra, Ramayana, Mahabharata, Thirukkural and so on. They are all applicable even for the management even in the 21st century.

Ancient Indian knowledge in Economics (This subject is the upaveda of Rigveda): The book on artha sastra written by Chanakya, known as Koutileeyam with many cross references books of dharma sastras/ smruthies dealing with this subject The detailed explanations about money, budget, banking, interest, loans, compound interest, penal interest, surety, witness, document preparations for loans, pledging of materials, leasing, etc. Detailed method of implementing sales tax, agricultural tax, property tax, gift tax, land tax, house tax, customs duty and penal taxes, etc. (as described in dharma sastra) can be seen in many dharmasastra books written during BC 500 and before.

Indian Philosophy (Philosophies are part of Upanishads which are known as vedantas or part of shaddarsanas: The philosophical compilations known as darsanas by Vyasa, Jaiminee, Patanjali, Gouthama, Kapila and Kanaada are - poorva & uttara meemamsa, yoga, nyaaya, vaiseshikaa, and sankhya are the most important books known as shad darsanas. Many fundamental principles of physics, chemistry, biology, etc are mentioned in the above darsanaas. Sankara’s Adwaita and Madhva’s dwaitha, The book of Charvaka known as Charvaka samhita of atheism,
etc. Other than the specific philosophical compilations, the philosophies are described in upanishads, Bhagavath geetha, Yogavasishta, etc.

Thus the knowledge of Hindus did not restrict mere rely on spirituality and acharas but also focused on every branch of modern science and technology. That is the reason why the western scientists are patenting many of these knowledge now.

**QUOTATION FROM INDIAN SCIENTIFIC HERITAGE - MATHEMATICS & ASTRONOMY**

**DISCOVERY AND USE OF ZERO:**

गायत्रे छद्द्रसंवाष्मै तपोते हवके अवशिष्ट स्यततेषु सुपरमपरनल्य हवहकाधः

शुद्धः स्वायाम्।।1। In gayatri chandas, one pada has six letters. When this number is made half, it becomes three (i.e the pada can be divided into two). Remove one from three and make it half to get one. Remove one from it, thus gets the zero (Soonya).

PINGALACHARYA IN CHANDA SAstra 200 B.C.

**CALCULATIONS WITH ZERO :**

विकारामात्यति घनत्राण्यभानि न शुद्ध संयोग वियोगस्ततु शून्याक्ष्य शुद्ध स्वरूपं

क्षयं स्वं वयायत्म।। स्वरूपं विभक्ता: - Nothing happens (to the number) when a positive or negative number is added with 0. When +ve and -ve numbers are subtracted from 0, the +ve number becomes negative and -ve number becomes +ve. When multiplied with 0, the values of both +ve and -ve numbers become 0, when divided by 0, it becomes infinity (khahara).

SRIPATI IN SIDDHANATHA SEKHARA

1039 AD.

**DISCOVERY OF PLACE VALUES - I:**

यथा एकः शतत्वाने शतं दशत्वाने दशोऽनुस्रातः यथा एकः प्रथी श्री-माता च उच्चते दुहिता स्वसा च इति - In the unit place the digit has the same value, in 10th place, 10 times the value and in 100th place 100 times the value, is given.

Vyasabhashaya To Yoga Sutra 650 AD

**DISCOVERY OF PLACE VALUES - II:**

यथाचैतकापि रेखार्थस्यानान्तर्भेदमिष्टकारोऽपि

दशशतस्वति दश शत शहस्रादिष्ठ शब्द प्रत्यय भेदमनुभविते
One and the same numerical sign when occupying different places is conceived as measuring 1, 10, 100, 1000 etc. - **SANKARACHARYA VEDANTA SUTRA BHASHAYA (700 AD)**

**KNOWLEDGE ON INFINITY:** अस्मिन्न विकारः खरे न राशिवपि प्रवेष्टेपि निःसूतेऽ बहुमूर्तिः स्थायिन्यसूतिकाले/नन्ते/चुये भूतं गणे सुभाटः - Nothing happens to the (huge number) infinity, when any number enters (added) or leaves (subtracted) the infinity. During pralaya many things get dissolved in Mahavishnu and after pralaya, during susruthi all those things get out of him. This happens without affecting the lord himself. Like that, whatever number is added to infinity or whatever is subtracted from it, the infinity remains unchanged. - **BRAHMAGUPTHA IN BRAHMASPHUTA SIDDHANTA 600 AD & BHAKARACHARYA II - BEEJAGANITA 1148 AD**

**USE OF AVERAGE VALUES:** गणयित्वा विस्तारं बहुस्त्रयानेनृतु तथ्युतिभान्व्य स्थानकामित्या सममितिरेवं दैवं च चेवे च - (For length, breadth and depth) the measurements should be taken at many places and the sum should be divided by the number of times (places) the measurement is taken. - **BHASKARACHARYA II IN LILAVATI 1150 AD**

**USE OF FRACTIONS:** द्रम्यार्थिनिलवहयस्य सुमते पादत्रयं यद्भवेत सत्तप्रज्ञा शंक शृंगारस्त्यभावणों: संप्रभुतेनाथिनो। दत्तोय येन वराठकः केति कर्त्येष्वात्पिठस्तेन मे ब्रूहि त्वं यदि वेतसि बलम गणित जाति प्रभगाभिधाम्। - One man has given to a beggar a fraction of 1 dramma (a unit of money). That fraction is one fourth of the one sixth of one fifth of the three fourth of the two third of the half of a dramma. Then tell how much kowdi (a unit fraction of the amount dramma) was given to the beggar?

**USE OF RATIO AND PROPORTION:** अयो दायस्त्रयं दम्य इति गावः प्रकटिता:। एकाय्यस्य सहस्त्रयं केति दान्त: केतीते।। (Out of 11 cattle) Eight are tamed and 3 are to be tamed and (how many are) to be tamed) if the number of cows is 1001? - **BHASKARACHARYA I - AYABHATEEYA BHASHAYA 628 AD**

**PERMUTATIONS AND COMBINATION** - 1: कुपकारिक क्षणायामलवण मधुरे: सबे रसे: ब्रह्मिः। विद्यमचारी सूपकारी व्यंजनामाप्यह केति भेदम्।। - Friend, a cook prepared varieties of food with 6 savours: pungent, bitter, astringent, acid, saline and sweet. Say what is the possible number of
varieties of food that can be made with these savours.

- SRIDHARACHARYA IN PATIGANITA 990 AD

PERMUTATIONS AND COMBINATION - II: पाशाङ्कुशाः हमचक कपाल शूले: खब्बंगरणकर शरचप्पुर्यर्थवत्ति। अन्योन्य हस्त कलिते: कति घूँकते: संधामोहररिव भाषारी सत्रोज शंखचक्के। - Pasa, ankusa, serpant, damaru, kapala, soola, khatvanga, sakti, chapa, sara with these (ten) items how many permutations and combinations are possible for Lord Siva. Similarly with the four items, sanku, chakra, gadha and padma holding in the hands, how many combinations are possible for Lord Vishnu?

- BHASKARACHARYA II IN LILAVATI 1114 AD

PARTNERSHIP AND SHARES: समवायसात् वणिज: पञ्चेककोतराधि भूलनाः। लाभेः सहससंख्ये तदस्त्र किं देयम्। - Five partners collaborate in a business. The capital invested by them are (in the ratio) one and the same number increasing successively by one (i.e. 1, 2, 3, 4, & 5) respectively. Profit that accrued amounts to 1000. Say what should be given to whom.

- BHASKARACHARYA I IN ARYABHATEeya BHASHYA 628 AD

LOANS AND INTERESTS: कुलम्बार्यमशस्त्रेन गृहीतं व्याधितेन वा उपजायनिमिति च विभादात्मकत्रूणं तत्। कन्यावेंशिकं चैव प्रेतकार्यं यत्कृतं एतत् सर्व स्रद्धात्वं कुलस्वेन कृतं प्रभो। - Loans are taken for meeting the expenditure connected with economic problems due to family burden, health problems, treatment, education, expenditure during accident, marriage of daughter, for performing rituals connected with the demise of the family members, etc.

- VISHNU SMRUTHI 100 BC

INTEREST CALCULATION: मालेन शतस्य फलं पन्चेको भाव्यके एकं धन्यं वृद्धि। लेखकपादी वर्षं पत्त्वाधिक नवशत्तिम्नय। - The rate of interest being 5% per month, the commission of surety 1% per month, fee for accountant ½% and charges of the scribe 1/4% per month, certain sum amounts to 905 a year. Find the capital, the interest and the shares of the surety?

- SRIDHARACHARYA IN PATIGANITA 990 AD

RULES OF CHARGING INTEREST: अयं उत्तममः अघमर्ग्याया दत्तात्त्व। विद्यं विद्यं चतुर्दशं पञ्चेकं च शतं प्रतिसमां। - The loans can be given and taken between borrower and lender. Generally charged interest rates are 2, 3, 4, or 5% per month. समाधानम च पञ्चा मासवृद्धि। पणशतस्य पञ्चप्पणा व्यावहारिकी ..... - Reasonable (dharmic) rate of interest is 1.25% per
month (i.e. 15% per annum) on the transactions with common man for non commercial purposes. But for commercial purposes (for making profit out of it) interest rate can be 5% per month. - *VISHNU SMRUTHI 100 B.C*

**RULES OF BODIES IN MOTION:** भके विलोमविवरे गतियोगेनानुलोमविवरे बृ. गतयत्रे रङ्गं वियोगकालालङ्कैः।

Whenever two bodies are travelling in the opposite directions, the distance between them is to be divided by the sum of their speeds. If they move in the same direction, the distance is to be divided by the difference of their speeds. This gives the time required for meeting of the bodies or the time elapsed after meeting of the moving bodies. - *ARYABHATA I - ARYABHATEEYA 499 AD*

एको ना योजनानां पद्य योजननां शरण नामः; संगमः क्व गमागमे॥

- One man travels at 8 yojana speed per day. Another travels at 2 yojana per day, starting simultaneously from the same place. After reaching the destination, the first man comes back. If the length of the track is 100 yojana. Say where is the meeting place of the two? (One going forward and the other traveller returning). - *SREEDHARACHARYA PATIGANITHA 990 AD*

**PROGRESSION OF THE TYPE $1^2 + 2^2 + 3^2 + 4^2 + \ldots$:** सपाताना अष्टांहि सप्तदशानां चतुर्भुजाशिर्षेऽः। एकविख्यातां वास्तेः पद्धतात्तता हि वर्गाः॥

- There are (three pyramidal) piles on square bases having 7, 8 and 17 layers which are also squares. Say the number of units there in. - *BHASKARACHARYA I - ARYABHATEEYA BHASHYA 628 AD*

**PROGRESSION OF THE TYPE $1^2 + 2^2 + 3^2 + 4^2 + \ldots$:** चतुर्वर्गावधूतिस्य वास्तेः क्षणं वर्गाः॥

- There are three pyramidal piles having 5, 4 and 9 cuboidal layers. They are cuboidal bricks (of unit dimension) with one brick in the topmost layer. Find the number of bricks used in them. - *BHASKARACHARYA I - ARYABHATEEYA BHASHYA 628 AD*

**PROGRESSION OF THE TYPE $\Sigma n + \Sigma n^2 + \Sigma n^3 + \Sigma n^4$:** द्विगुणाशीतमृद्धं सैकंपृदं प (द) दल्हतं भवति॥

- The number of terms plus one, as multiplied by twice the number of terms plus one, being (further) multiplied by half the number of terms. संकल्पितकृतियनां संकल्पितसमानां मे कथय॥
Friend, if you know, then say after calculation (i) the sum of successive sum of 6 natural numbers (ii) the sum of the squares of the first 6 natural numbers and (iii) the sum of the cubes of first 6 natural numbers. **FIRST DEGREE INDETERMINATE EQUATION**

- 7 kudavas (unit of measurement) of mudga are obtained for 9 panas and ½ kudava of rice is obtained for one pana. Then O! merchant take 3½ panas and quickly give me one part of rice and two parts of mudga. - *Sreedharacharya* 990 AD

**FIRST ORDER EQUATION - I**

- By opening 4 inlets separately, one pond gets filled respectively within 1, ½, 1/3, and 1/6 days. If all the four inlets are opened together, how much time (in fraction of the day) is required to fill the pond? - *Bhaskaracharya II* - in *Lilavati* 1114 AD

**FIRST ORDER EQUATION - II**

- If 9 gulika and 7 rupaka are equal to 3 gulika and 13 rupaka, what is the price of one gulika? (the answer can be determined through the same method followed above). *Sreedharacharya Patiganitha* 990 AD

**EQUATIONS OF HIGHER ORDER - I**

- One third of a troop of monkey with one third of it to itself gone to the tank; the square root of the whole troop is afflicted with thirst, and the remaining 2 monkeys are sitting under the mango tree. What is the total number of monkeys? $\frac{1}{3}a + \frac{1}{9}\sqrt{a} + a + 2 = a$ - *Sreedharacharya Patiganitha* 990 AD

**EQUATIONS OF HIGHER ORDER - II**

- I saw that one half of 7 times of the square root of the total number of swans were slowly moving away in the river. Remaining 2 are playing in water. What is the number of total...
swans? (equation: \(7/2 \sqrt{a + 2} = a\)) - **BHASHARACHARYA - LILAVATI 1114 AD**

**PYTHAGORUS THEOREM DISCOVERED BY BOUDHAYANA**: समत्रत्रस्त्रस्थितार्तुः हितावित्त भूमिः करोति। - The diagonal of a square produces double the area of the square. दीर्घबालस्त्रस्थितार्तुः पार्श्वमाति तिर्यग्मानि च दस्तुयामूले कुलसत्तुमण् करोति। - Areas produced separately by the length and breadth of a rectangle together equal to the area of the (square) produced by the diagonal. - **BOUDHAYANA BOUDHAYANA SULBASUTRA 700 BC**

**ANGULAR DIMENSIONS**: अंगुगणवेवदुतातः कलिका विकला: समुद्रजलधय: स्तम्भलझाण्डास्ती दृष्टिशृण: कलिका: शरानायो विकला: त्रिज्याक्तिरस्त्रनविन्दुभूय: विर्धे निरांशा। - 3436° 44'' is radius and 11818047° 35'' is square of radius and 1398° 13'' is Rsin of 24° (both are values in radians). - **VATESWARA - VATESVARA SIDDHANTA 580**

**TRIANGLES**: विभुजायु कल्लोरं समस्तकौटि पुनःनार्तिं:। - The area of a triangle is the product of the perpendicular and half the base. - **ARYABHATA I ARYABHATEEYA 499 AD** कर्षस्त्रयोदश स्वातु पञ्चदशायो मही दिस्मेत्व। विष्णुविन्दुभूय संह वक्ष्य रस्तो होदेश्व।। - What is the area of a scalene triangle in which one lateral side is 13 units, other 15 unit and the base is 14 units. अष्टदशकौटियों बंगो बातेन पातितमुलल। चहुँग्नासी परितासिमुत्तुं कृत्या कविभग: स्वात।। - A bamboo of height 18 cubits fell by the wind, it falls at a distance of 6 cubits from the root, thus forming a right triangle, where is the break? - **BHASKARA I COMMENTARY TO ARYABHATEEYA 628 AD**

**CIRCLE - VALUE OF \(\pi\)**: चतुर्दशकं शतमन्द्युगं हरचिस्तय्य सहस्तां अनुतद्य विष्णूविन्दुवाणानुतुरपरिणाम:।। - When 100 increased by 4 multiplied by 8 and added to 62,000 gives an approximate value for the circumference of a circle having diameter 20,000 units. - **ARYABHATA I ARYABHATEEYA 492 AD** अष्टदशकाच्या: विष्णूविन्दुवाणां भया दृष्टा:। तेन्य समस्ताणां परिधिसम्बं ने पृथ्वी बुध।। - Diameter of 3 circles are correctly seen by me to be 8, 12 and 6 units respectively. Tell me separately the circumference and areas of the circles. - **BHASKARACHARYA I - 628 AD**

**SOMAYAJI'S THEOREMS** (1) व्यासः वनसंगणितात् पृथ्यातं तृयाधुनिमलयह:। त्रिगुणव्यासे स्वमृण क्रमः कृत्यापि परिधितानेपु:।। - Multiply the diameter of a circle with 4 and keep it at different places and divide each with the odd numbers beginning from 3, 5, 7, ... as their cubes subtracted by the same value. Repeat this and add/subtract alternatively the results to three times the diameter of the circle to get the circum-
ference with the highest degree of accuracy. This theorem can be mathematically represented as follows: Circumference = 3D+4D/(3^3-3)-4D/(5^3-5)+4D/7^3 7 =... (2) चरणः यथाभाग्यं व विकणातीधिकारं द्विन्द्रवणं। व्यां च पद्ध्वं विभेद्यत् फलं स्वं व्यासं विनिवृत्ततया परिपूर्वस्यायं। - Six times the diameter is divided separately by the square of twice the square of even integers 2,4,6,... minus one, diminished by the squares of even integers themselves. The sum of the resulting quotient by thrice the diameter is the circumference. This can be mathematically written as follows: Circumference = 3D+6D[(1/2x2^2-1)^2-2^2] + [(1/2x4^2-1)^2-4^2] + [(1/2x6^2-1)^2-6^2] +... - PUTHUMANAL SOMAYAII - KARANAPADDHATI 1450 AD

AREA OF CIRCLE AND SPHERE: योज्यते परिमित्तव्यासपद: फलं तत्त्वपुर्णं वैदिकविशिष्टपरिणामं कुरुक्षेष्वत: जलां। गोवर्धपं तदपि च फलं पूर्णं व्यासित्विच्यं विद्वानं व्यवस्थितं विषयं गोवर्धपं विभक्तिम्। - When circumference is multiplied with diameter and that result divided by 4, that will give the area of a circle. This when multiplied with 4 gives the surface area of the globe which is like surface of a ball. This when multiplied with diameter and divided by 6 gives the volume of the sphere of globe. Mathematically it can be written as 2Ør x 2r/4 =Ør^2.

BHASKARACHARYA II - LILAVATI - 1114 A.D

NEWTON GAUSS (1670AD) BACKWARD INTERPOLATION DISCOVERED BY VATESWARACHARYA: धनुरङ्गस्य भुक्तं पूर्व जीवित्त्वा लघुः सद्यवर्त दलित्वम्। लघुः विवर्षहः च संस्तोभ्य नियोज्यं विकल्प्या। - In modern mathematical form this interpolation formula can be written as f(x) = f(xi) + (x-xi)/1/h Df(xi-h) + (x-xi)/1/h. (x-xi+h)/1/h. D^2f(xi-h)/2. - VATESWARA VATESWARA SIDDHANTA 204 AD

ARC AND CHORD: स्वतंत्रवस्थापनप्रवृत्तिस्थाबागो विनियोज्य कृतिरिकर्णिमिततम्। शिक्षा-प्रदेशथिधिःवनिविद्रते तथैव फल्कण्योऽसकृत्तधमुः। - The chord of an arc of a circle is obtained from the result of the cube of the length of the arc divided by six times the cube of radius and subtracted from the arc. This can be mathematically presented as follows: Chord (R Sine q) = s - (s^3/6r^3). Here length of the arc s is in angular dimensions, r is the radius and q is the angle of the arc. - PUTHUMANAL SOMAYAII - KARANA PADDHATHI - 1450 AD रितापि: यशेभावन्यं विषयमार्गायं सा तुल्य। - The chord of one sixth of circumference is equal to the radius of that circle.

ARYABHATTA I - ARYABHATTEYA 499 AD
LENGTH OF ARC - CHORD: व्यासाध्वियतपुत्रपीर्विकाय विभक्ती जीवविधिपथागुणित: परियेतस्तुर्ग:। लेखीनित्तत परियेशि: चतुर्भ्रमाणाद्वा पदे बृत्तिलात् पतितेष्ठत्: स्वतः।।

One fourth of five times the chord multiplied with square of circumference divided by four times the diameter added with the chord. This value is subtracted from one fourth of the square of circumference. Square root of this is taken and subtracted from half of the circumference to get the arc. ARC AND ARROW:

When the sum and differences of diameter and the chord are multiplied, and their square root is taken and if half of that is subtracted from the diameter, the arrow is obtained. The difference of diameter and the arrow multiplied with the arrow, twice the square root of that value gives the chord. The square of half the chord divided by arrow and added with arrow gives the diameter of the circle.

BHASHAKARA II - LILAVATI 1114 AD

NEWTON'S INFINITE GP CONVERGENT SERIES DISCOVERED BY NILAKANTA SOMAYAJI: एवं वस्तुतवैद्वे परम्पराय वस्तुतवैद्वे अर्थसंवै: तत्स अर्थवादम्। अंि कल्याणपति योगपति आधारपतिन: वस्तुतवैद्वे एकोपवैद्वे साध्व सर्वस्विरिनि समानं एव...... - Thus the sum of an infinite series, whose later terms (after the first) are got by diminishing the preceding or by the same divisor, is always equal to the first term divided by one less than the common mutual divisor.

NILAKANTA ARYABHATELYA BHASHAYA 1444

SINE, COSINE, RADIUS AND ARC: अन्योन्यकोटिहृदयोपिरिक्षित गुणणविद्विजयवयं हतयोः। योगवियोगी स्वतंत्रवर्तकं गणविद्विजयवयं विविद्विजयवयं।।

The sum of the products of Sin A and Cos B and when angles are exchanged, Sin B and Cos A, gives the Sin of the sum of the angles. Similarly the difference of the above gives the value of the sin of angular difference. Sin (A+B) = Sin A Cos B+Cos A Sin B And Sin (A-B) = Sin A Cos B - Cos A Sin B. चतुर्भ्रमाणां चतुर्भ्रमाणान्तरत्वार्दं चतुर्भ्रमाणान्तरत्वार्दं चतुर्भ्रमाणान्तरत्वार्दं

Square root, of the square of a chord (R sin q) diminished from squares of radius gives the koti (R cos q). This subtracted from radius gives the (small) arrow of arc. This added to radius is big arrow of the arc......

PUTHUMANA SOMAYAJI - KARANA PADDHATI 1450

TAYLOR (1685 AD) SERIES OF SINE AND COSINE DISCOVERED BY NILAKANTA
Placing the sine and cosine chords nearest to the arc, whose sine and cosine chords are required, get the arc difference to be subtracted or added. For making the correction, 13,751 should be divided by twice the arc difference in minutes and the quotient is to be placed as the divisor, divide the one (sine or cosine) by this divisor and add to or subtract from the other (cosine or sine) according as the arc difference is to be added or subtracted. Double this result and do as before. Add or subtract the result to or from the first sine or cosine to get the desired sine or cosine chords.

**NEWTON GAUSS (1670) INTERPOLATION FORMULA DISCOVERED BY GOVINDASWAMI**: गणितज्ञ गणांतरस्पर्शित्य संयोजनांशेत्रभाषांसा गणितज्ञ नगरित्य गणितज्ञ नगदशायांशेत्रभाषांस।

Mathematically this formula is summarised as follows:

$F(x+nh) = Df(x) + nf(x) + \frac{1}{2}n(n-1)(Df(x) - Df(x-h))$

Multiply the difference of the last and the current sine differences by the square of the elemental arc and further multiply by three. Now divide the result so obtained by four in the first rasi, or by six in the second rasi. The final result thus obtained should be added to the portion of the current sine difference (got by linear proportion). In the last rasi, multiply the linearly promotional part of the current sine differences by the remaining part of the elemental arc and divide by the elemental arc. Now, divide the result by the odd numbers according to the current sine difference, when counted from the end in the reverse order. Add the final result thus obtained to the portion of the current sine difference. These are the rules for computing true sine differences for sines. In the case of versed sines, apply the rules in the reverse order and the above corrections are to be subtracted from the respective differences.

**GOVINDASWAMI - COMMENTARY FOR MAHABHASKARIEYA 800 AD**

*Nilakanta - Tantra Sangraha 1444 AD*
NEWTON'S (1660 AD) POWER SERIES DISCOVERED BY SOMAYAJI:

Multiply repeatedly the arc by its square and divide by the square of even numbers increased by that number and then multiplied by the square of radius. Place the arc and result one below the other and subtract each from what is above it. To derive the arc, which are collected, beginning with the expression Vidvan (kapatayadi number). Multiply repeatedly, the unit measurement which is the radius, by the square of the arc and divide by the square of even numbers decreased by that number and then multiplied by the square of radius; the first is, however, to be divided by twice the radius. Place the results one below the other and subtract each from the one above it. That is the method to derive the saras, which are collected in the beginning with stena. (This equation is now known as Newton power series.) - PUTHUMANA SOMAYAJI - KARANAPADHATI (1450 AD)

VOLUMES OF CONES: Somavatavatirthay: Suvichatae kalam bhavita. - The one third of the volume of the uniform cylinder is the volume of the cone. Pariyogita paryagnita rathasabha chakr: Kail antakarsanyat sparshya tishyaiti. 

Friend, the food grains are kept at a circumference of 30 cubit in the floor, outside corner of the room, inside corner and side of the wall. Find out the volume of the grain if the height is 45 cubit. - BHASKARA II LILAVATI 1114 AD

LHUILER'S (1782 AD) FORMULA DISCOVERED BY SOMAYAJI:

The three sums of the product of sides, taken two at a time are to be multiplied together and divided by the product of the sums of the sides taken three at a time and diminished by the fourth. If a circle is drawn
with the square root of this quantity as radius, the whole quadrilateral will be situated inside it. - Parameswara Commentary for Lilavati (1360 AD)

Gregory's (1632 AD) Series for Inverse Tangent Discovered by Madhava Charyya

इष्टयथायोणाति कोट्यां प्रथम फलं ज्याकर्ण गुणकं कृत्या कोटिवर्गं च हारकं प्रयमदेश्वरोऽर्थे नेता फल कृतिमुद्रं। एक त्रयाधीन संख्याभिदेशकेष्वेच्छनुकलात्र चोजानां संयुक्तस्यक्तिवर्गं धनुर्भवेत् दो: कोट्योलगोनखं कल्पनीयं इत्यक्तं लब्धिनां अवसानं स्थानं तत्परं मुहः कृते - Obtain the first result of multiplying the jya (R sine q) by the trijya (radius) and dividing the product by koti (R cos q). Multiply this result by the square of the jya and divide the square by the koti. Thus we obtain a second result a sequence of the further results by repeatedly multiply by the square of the jya and dividing by the square of the koti. Divide the terms of the sequence in order by the odd numbers 1,3,5,...; after this, add all the odd terms and subtract from them all the even terms (without disturbing the order of the terms). Thus is obtained the dhanus whose two elements are the given jya and koti. (Here the smaller of the two elements should be taken as the jya, since other wise the series obtained will be non finite) (use of Tangent) - Madhava Yuktibhasha? (1350 AD)

Leibnitz (1673 AD) Power Series Discovered by Somayaji: व्यास सारस्वतधिमानिति किष्किष्किष्किष्किः व्रतिधिमानिति विराजिति श्रीमंतसत्वत्र त्वं पूर्व क्रमावधियः। Multiply the diameter by 4. Subtract from it and add to it alternately the quotients obtained by dividing four times the diameters by the odd integers 3, 5, 7,... This will give the fine value of the circumference i.e $\Pi/4 = 1 - 1/3 + 1/5 - ...$ - Pithumana Somayaji - Karanapaddhati (1440 AD)

De Moivre's (1650 AD) Approximation Discovered by Madhava Charyya: अभमाद सूक्ष्मतरं त्यो निलिङ्गायनं करणाविनं संकारं अन्तम संख्यानिस्ते कु ण: स एव दु:पुः। युग्मगुणितो रूपःैत मसंख्यांनावलं हरे भवेद्ध हारं विद्यादु: विद्यादुः हरणात् परं एवं एवं वा कार्यम्। A correction for circumference still more precise is being stated here. The multiplier is the square of half the even integer increased by unity. This multiplier multiplied by 4, then increased by unity and then multiplied by half the even integer is the divisor. This correction may be applied after
the division by odd integers, 3, 5, etc. i.e Circumference = 4D (1-1/3+1/5-1/7..... + ...-1/n(½(n+1))^2+1, ((½(n+1)^2 x 4 +1) (½(n+1)) - MADHAVA KRIYA KRAMAKARI (1350 AD)

DE MOIVRE’S (1650 AD) APPROXIMATION: पत्तूक्ष्यप्याठ्यं हरणे कृते निवृत्ताहितिस्तु जामित्या तस्य ओर्ध्ग्यतास्यसंगतस्य तद्भवं पुण्यत्र क्षीत्या स्यात् तर्कगत्वहतो हराय व्यासायभदित: प्रमण्यत तस्य आर्यं स्वमुच्ये कृते धने शोचनान्य करणीं सुभम: परिधि: सा स्यात् बहुकुच्ळयो हरणतो/तिसूक्ष्याश्च - .......... Let the process stop at a certain stage, giving rise to a finite sum, multiply four times the diameter by half the even integer subsequent to the last odd integer used as divisor and then divide by the square of the integer increased by unity. The result is the correction to be added to or subtracted from finite sum. The choice of addition or subtraction is depending on sign of the last term in the sum. The final result is the circumference determined more accurately than by taking a large number of terms: - MADHAVA YUKTIBHASA (1350 AD)

HORIZON: आवेस्मानमय तानि दलाप्रवृणा यदवृत्तं हरीं ध्वितं तदादु: यसीन् भवेत् समुदयोपयोगिस्तत्रस्वात्त्व क्रांत्यमूलकृणस्य वंशावानाराणा - The great circle which goes round them, dividing each of them into two equal parts, is called harija or kshitiya. This in modern astronomy is horizon. This is the circle on which rising and setting of stars and planets take place towards east and west respectively. - VATESWARA SIDDHANTA 880 AD

ASTRONOMICAL DEFINITIONS: उत्तरवच्छधो/परपूर्वामिश्यां प्राहूर्दित सममंदलमन्त्रित। तसद्धोलत रद्दिकिर्त्वं कठपुण्यं विदितोरंपी तदादु। - Vertical circle passing through the west and east cardinal points is the first circle: this is called the samamandala. (This circle is the prime vertical. Another similar vertical circle (called the yaamyottara-vrutta) which passes through the north and south cardinal points is called the meridian. - VATESWARA - VATESWARA SIDDHANTA 880 AD

TYCHO BRAHE REDUCTION OF ECLIPTIC DISCOVERED BY ACHYUTA PISHAROTI: पातोनस्य विधोहतु कोटिगुणायोजीवे मितत्साह्यरुपं अन्त्यसेष शराहं वधमुङ्गे (विकोटस्याभरे)। लवं व्यासंलोणदृश्यं हिमाकरे दर्दं विधड़ विढ्यं युमायुम्यतोपये विषुप्रयोगम्पो महोऽधे भवे। - Multiply the tabular cosine and sine of the moon minus node and the product by the tabular versine of the
maximum latitude of the moon. Divide this by the tabular cosine of the latitude at the particular moment and the quotient is to be divided again by the tabular radius. The result is to be added to or subtracted from the moon's longitude, as the moon minus node is in an even or an odd quadrant, respectively. The true moon measured on the ecliptic is thus obtained. - Achyuta Pisharoti Sphtanirnaya

EQUATOR: खस्त्वस्तिकादृ दक्षिणावृक्ष (अपि) संत्तत्तििर तथोत्तरेण। नाहिक्ष्ठितं वै पुच्छं तथूकं वृक्तं भगोलकं खगोलमयं।।। - The sphere of the asterisms lie within the sphere of the sky. Great circle of the sphere of asterisms which lies towards the south of the zenith by an amount equal to the degrees of local latitude and towards the north of nadir by the same amount and which is graduated with the division of nadis is the Vishuvathvrutta. This circle is called the equator. 6 O'CLOCK CIRCLE. - पुर्वपरिवर्तिनस्यमयोर्वतितं याव्यादत। नमलौः स्वतिन दिशायनं सौम्यास्यपरि समसुमार्ग संविक्षणं दिनिनिषोः श्वेषितमित्रत। - Passing through the two points of intersection of prime vertical and horizon, lying below the south cardinal point by the degrees of local latitude, fastened to the horizon, and lying above the north cardinal point, passing through the north celestial pole, is the Unmadala, the cause of decrease and increase of the day and night. (This in modern astronomy is known as the 6'o clock circle.) CIRCLE OF DIURNAL MOTION: हर्षवर्षमलयादक्षिणाकेदारिकमित्रिः। उदयाभागोऽथ युथाद्युथंकृतुथकान्तरानिवीच।।। - R sine of the arc of the horizon lying between the prime vertical and the diurnal circle of the planet is the R sine of agra (now known as the rising point of the planet) and the R sine of the degrees of diurnal circle lying between six o'clock circle and the horizon is bhoojya (bhujya) which is termed as Earthsine. DAY RADIUS: क्रृतिज्ञानातिब्रह्मास्यमयोः स्वेतात् द्वीपाः ते नित्याक्षरात्सांसागात्स्य मूलं वा।।। - Day radius is equal to the square root of the difference obtained by subtracting the squares of R sine of the declination from the square of the radius or the square root of the product of the difference and the sum of the radius and the R sine of the declination. ECLIPTIC: नाहिक्ष्ठितं ज्युलादित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गिनितत्तित्वं गि
Fastened to the so called nadivrutta or the equator at the points of Aries and Libra and lying 24 degrees of the south (of equator) at the first point of Capricorn and 24 degrees to the north (of equator) at the first point of Cancer, there is a great circle called the apakrama vrutta (now known as the ecliptic). - VATESWARA SIDDHANTA 880 AD

**DAY DIAMETER**: विपुचुज्ञया/यामध्यवर्गविशेषमुलंभलाम्बकः। क्रन्तिज्ञया
कृत्योर्न्तरपदं हिगुणं दिनव्यासः। - Square the sine of latitude and deduct from the square of the radius. Its square root is the sine of the co-latitude (its arc being the co-latitude). Square the sine of the declination deduct from the square of the radius and find its root. Twice the result is the day diameter. - PANCHASIDDHANTIK A 4-23 - VARAHA MIHIRA 505 AD

**SETTING POINT OF ECLIPTIC**: प्राच्यामुकपक्रमवस्तुसहृदं प्रागार्यमहुः। (परीतोर्वतलगन्त) स (प) म (रा) शि (र) स्त तत्या (स्त) कालो अयुद्धो। स्य भूपाल। - Point of intersection of horoizion and the eclipc in the eastern half of the celestial sphere is called pralagna. I.e. the rising point of eclipc; the same in the western half is called astalagn, known as setting point of eclipc. RISING - SETTING LINE: व्यासायवृत्तो/तरमेतयो। स्वाच्छरायज्ञवा परपूर्वप्रसिद्ध। अग्रार्ययोतं हरिजं निकबं स्वं। प्रहस्यायुद्यस्य रंगम। - The arcual distance between the six o'clock circle and the horizon measure, along the R circle trijayavrutta known as great circle of the celestial sphere, supposed to be of radius 3438’ (minute of angle) is the charardhajya. It is called the R sine of the Ascensional difference. A thread tied to the extremities of the agra on the eastern and western halves of the horizon is called the udayaastasatra. (In modern astronomy it is known as the rising - setting line of planets). - VATESWARA SIDDHANTA 880 AD

**DAY RADIUS AND EARTHSINE**: क्रन्तिज्ञान्तरज्ञया धुल्या वा चरदल जीवया
हस्ता विज्ञाशिति जीवना स्वाहोरात्मार्जीया वा। - Rsine of the difference between the three signs and the declination is also equal to the day radius. Day radius multiplied by earthsine and divided by the R sine of the Ascensional difference gives the day radius.
SUN'S PRIME VERTICAL: उधर्‌मध्ये/परपूर्वमिहाय ध्रुविरिद्ध सममण्डलमन्यत्।
तदर्ध्रुवोत्तरलक्षणविद्यम् ज्युतियोग विदिशारूपी तदद्।। - Vertical circle passing
through the west and east cardinal points is the first circle called
samamandala or the prime vertical. - VATTSWARA SIDDHANTA- GOLA. 3-1. 2
880 AD

PARALLAX-I: तिर्धनरत्स्य क्रमशिङ्गिनी होता समम्यलानप्रभवेन शादु.ना।
क्षमापज्जकर्मिधाराकेनहेत्त विलबने स्याय घटिकादि वा फलम्।। - R sine of the
hour angle at the amavasya multiplied by R sine of the altitude
of the meridian ecliptic point and divided by 2954961 gives the
parallax in ghatikas at mid eclipse. PARALLAX-II: विरासिनीया बलनायका
हुना शिलेनुम्ब्रंगुलं द्रजन्ति ता: हिसाहुणु दृष्टिगति: शराचाचैविन्धाजिता लम्बनावलिका
फलम् - Radius and the valanajiya when divided by 5, are converted
into angulas. The R sine of driggati multiplied by 2 and divided
by 75 gives ghatika of the parallax in longitude. PARALLAX-III:
नत्रकमस्त्यायायकेवकुलिघना स्याल्पम्बन्त तत्यरसीयुहुः दृष्टेष भूक्तन्तरमोल्लर गातः:
खालणुपमलिङ्गो नतिः स्यायः - R sine of the hour angle multiplied by
R sine of altitude of the meridian ecliptic point and divided by
5625 gives parallax in longitude. The Difference of true motions
of the Sun and the moon multiplied by the R sine of drikshepa
and divided by 2250 gives the parallax in latitude. (Sishyadhi
vrudddhi Tantra 13-12) APOGEE, PERIGEE AND ORBIT OF
EARTH: स्वोच्चता परमाणुगणाधिको यदा तदा भवति स्ववीचयः। दूरे निवासम उपर्याः:
कर्णवशानकोलचो निकटे।। - When a planet is at a distance of 6 signs
from its apogee, it is said to be at the perigee or neecha. When a
planet is at the apogee, it is farthest from the earth when at the
perigee, it is nearest to the earth. This is so because of the length
of the hypotenuse in each case (Sishyadhi vrudddhi Tantra 14-10)
SHAPE OF EARTH: गणमयीवादनिजलमण्यमया महाभूतगुणपूर्व: खस्य:। क्षायिरावृत्तोथ्यं
भण्डराना भूमि भूगोल:।। - Spherical earth, made of ether, fire, air, water
and clay (Panchabhoothas) and thus have all the properties of
the five elements, surrounded by the orbits and extending upto
the sphere of stars, remain in the space प्रगुणः:परिधः: शतशस्त्रो गणित्या:
कष्यप्यति दृष्यते। प्रतिभाति तदा समा यती विषये यत्र त्येय गम्यते।। - Mathematicians
say that one hundredth of the circumference of the earth
appears to be plane. So, that portion of the earth appears to be plane to an observer (Sishyadhi vruddhi Tantra 20-35) -

**LALLACHARYA SISHYADHI VRUDDHI TANTRA 700 AD**

**ROTATION OF EARTH - I:** यह भूमि तर्कु र प्रति काला कथित करता नहीं करता. यहाँ मंदिरम् आर्य कुल बुध्यक्षेत्र मम पतन्त्र समुच्चाया: कर्मात्।। If earth rotates at a speed of 1° of an angle in 4 seconds, will not the things on the loft fall? Where does the earth go in this speed? (Brahmasphuta siddhanta 11-17). - **BRAHMAGUPTA BRAHMASPHUTA SIDDHANTA 629 AD**

**FOUR QUADRANTS OF EARTH:** उदयो यो लक्ष्यायां सोहस्तमयः सविक्षिप्त सिद्धरूपः। मध्याह्नो यक्षोंया रोमकविषये/रजीतां स्वात्।। When it is Sunrise in Lanka, the same Sun sets in Siddhapura. (Gautimaala). It is noon in Yavakoti (Korea) and midnight in Romaka (Rome) (Aryabhateeyam 4-13) - aryabhata - I (499 AD)

**GLOBE:** समवृत्तरुपायां सूक्ष्म गोल्य प्रसाध्य दारामयं यथितथां समाहितकाल भोगेश्बराय परियाय।। - Perfectly circular throughout and spherical, made of wood, marked with degrees and minutes, incorporated with lines both longitude and latitude at ends, is the golayantra. (Panchasiddhantika 14-23) - **VARAHAMIHIRA PANCHASIDDHANTIKA (595 AD)** कालान्तं समवृत्तं समन्तं: समगुंधु लर्प गोलं पारस्तेष्टजलेत्तं भ्रमेऽत्। स्वर्य: च कालान्तं।। - Made of wood, fully circular, uniform, equally dense throughout and spherical shaped golayantra, which rotates at a fixed rate of time as the earth does by the help of mercury, oil and water, by the application of our intelligent calculation, is the golayantra-Globe. - नूपियोजनं जिला भूमयासो ........... 8000 Nr units is equal to one yojana. The diameter of earth is 1050 yojana.

**ROTATION OF EARTH - II:** कु र्वि शि बु ल्लु २ खु प्राकः ...... - Eastward rotations of the earth in one Yuga is 1582237500 अनुलोम गतिन्तः: पश्चात्वचल विलोमाय यहत्। अचलानि भाओ तस्मात समयितिनागानि लक्ष्यायाम।। - Just as a man in a boat moving forward sees the stationary objects as moving backward, so are the stationary stars and celestial bodies seen by the people at equator (Lanka) as moving exactly towards west. ......कु आवर्तशचापि नाकतः।। - The rotation of the earth is the cause of days (Aryabhateeyam 3-5). - **ARYABHATA-1 ARYABHATEYA (499 AD)**
MERIDIAN: लहकायामें शहकुकिल प्रतिस्थाप्त तेनैक सूत्राय बद्धया पुनर्मरोहपरी तद्ग्रंममयत बद्धया यथा यथा द्वारातः। तद्वत् भूमायपि काचितेऽह। लहकाया खारपूर्त: मेठमत्तकान वगाहु विशिष्ट द्या इत्यतः-देशान्तरविथयांनियो यस्तु।। - Fix a pole in Lanka, tie thread on that, take the other end to the North pole, tie it there also, then one can see the line of the thread passing through Lanka, Kharapuri, Arctic point and so many other countries upto the top of Meru. This is international meridian line (Sankaranarayana on Laghubhaskareeya I-23) - SANKARANARAYANA 1 LANGUBHASKAREEYA (950 AD)

GRAVITY: आकृतिशालित्रमहि तया यत् खस्तं गुरु स्थापितवर्ष स्वशक्त्या। आकृत्यते तत्ततीति भारत समेन समन्तात क्ष पेतत्यं खे।। - This earth attracts whatever solid materials are in the space, by her own force of attraction towards her (earth). All those subjected to this attractional force fall, to the earth. Due to equal force of attraction among the celestial bodies, where can each among them fall? (Siddhanta siromani Bhuvanakosham 6) - BHASKARA II SIDDHANTA SIROMANY (1114 AD)

MERIDIAN AND TIME: देशान्तरवर्षीयणा मथ्या भूकित्युद्धारिणिः जस्तया भक्तमूर्ध्य प्राच्याः रेखाया: परिच्छे धनम्।। - The time is calculated based on the meridian. Divide the time by 60... and the longitude is calculated. Towards the east subtract and towards the west add the number (Laghubhaskareeyaam 1-31) - BHASKARA I LANGUBHASKAREEYA (628 AD)

MERIDIAN AND TIME: पञ्चायतर विभिन्नशस्यसंयुतैयोजनेशच नादयेका। समप्ल पश्चिमस्थिततिः शोभा च देया च।। - One nadi for every 53 1/3 yojanas has to be deducted or added (to Ujjaini) by the people in places east and west, respectively of the Ujjaini meridian. (Panchasiddhantika 9-10) - VARAHAMIHRA - PANCHASIDDHANTIKA (605 AD)

ECLIPSE-I: धिम्यर्तकृत्यं शक्तिं हृदकेर्कीयं चतुं च प्रसत्र इतिश्रयते। सपि पौराणिक श्लोकौऽक: पुनरिन्ना राहरित्युप्यते।।

What does it mean that Asura is responsible for the eclipse? Others say that a snake Rahu swallows the Sun and the Moon! Those are puranic stories! Then what is called the Rahu? - SANKARANARAYANA COMMENTRAY TO LANGUUBHASKAREEYA 950 AD
Moon covers (shadows) the Sun and the great shadow of the earth covers the moon (which causes the eclipse). - **ARYABHATA I ARYABHATEEYA (499 AD)**

**ECLIPSE-II:** अत एव भूच्छाया चन्द्रग्रहणस्य कारणं - That is why it is said that the shadow of the earth is the cause for the lunar eclipse. - **SANKARANARAYANA COMMENTRAY TO LAGHUBHASKAREEYA**

असुरो यदि मायया युद्रो निष्ठुता/तिप्रसतीति ते मतम। गणितिन करं स लम्प्ते प्रह्लक्ष्यवर्ष विना कथवन।। - If you are of the opinion that an artificial demon is always the cause of an eclipse by swallowing, then how is it that an eclipse can be determined by means of calculations. Moreover why is then not an eclipse occur on a day other than the day of new or full moon - **LALLACHARYA SISHYADHI VRUDDHI TANTRA 700 AD**

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